

## Interactive Whiteboards



*The Biology class is studying the functions of the heart with a graphical and text-based presentation projected onto the interactive whiteboard. All queries are clarified by drawing on the large, touch-sensitive screen. As well as allowing a number of pupils to click on an organ and visually explore its relationship with the heart, the teacher draws arrows to indicate the direction of blood flow and later initiates a discussion to test their understanding of the topic. The teacher has also linked parts of the diagram to other web-based and computer-based multi-media resources. The students use the board's authoring software and make presentations to their classmates. The lesson including some changes is stored for future use.*

### What is an Interactive Whiteboard?

An Interactive Whiteboard (IWB) is a large, touch-sensitive (thus interactive) board that when used with a combination of a computer and digital projector facilitates interactive ICT engagement. It resembles a traditional whiteboard and is used similarly. The computer connected to the interactive whiteboard can be controlled by touching the board directly or by using a special pen. From the research available, it seems clear that the interactive whiteboard is widely considered to be a positive asset to the classroom. However, it is not without its problems. Technical support issues and a steep learning curve in the initial stages are factors that a school planning the purchase of an IWB should consider.



### Possible Educational Uses

Interactive whiteboards present educational resources in a highly interactive way and are suitable for whole class and small group settings. They allow pupils to engage and interact with the technology to become active participants in learning. Pupils with special needs can particularly benefit from a presentation of multimedia content on a large screen as it can aid in both information processing and retention. Optimal use of an interactive whiteboard involves both the teacher and students using it in a classroom situation. It can, for example, be used to:

- Allows presentation of student work in a more interactive and collaborative model
- Show video clips that explain difficult concepts (in any curricular area)
- Demonstrate how an educational software program works, e.g., an art program with students using their fingers and hands to draw rather than working with a mouse
- Cater more effectively for visually impaired students and other students with special needs
- Display Internet resources in a teacher-directed manner

- Create handwritten drawings, notes and concept maps during class time, all of which can be saved for future reference

### Teacher Readiness

Teacher Professional Development (TPD) is crucial to the effective use of the technology. Training is needed in how to actually use the technology and its components. But also teachers need training on the most effective approaches to take advantage of the technology. This, in some cases, will mean a significant change in the teaching style of the teacher involved.

### Alternatives to Interactive Whiteboards

Given the cost of up to €5,000 (inc VAT) per IWB package (or per classroom) from some IWB providers, schools need to give serious consideration to the possible alternatives that are available. Schools need to be confident that the expenditure costs per classroom from an overall school ICT planning perspective, represent good value for money. Schools which have classrooms without digital projectors should especially consider purchasing alternative ICT configurations for example high quality fixed digital projectors for up to 6 or more classrooms or up to 10 desktop or laptops PCs, wireless keyboard and mouse or wireless slates.

NCTE recommends that fixed digital projectors should be a higher priority in classrooms, rather than installing interactive whiteboards in one or a small number of rooms. Digital Projectors provide excellent value for money and are essential to ICT enabled classroom learning, as well as being a prerequisite for an interactive whiteboard at a later time.

Digital Projectors can initially be used with a PC or laptop for whole class teaching, large image presentation, access to online resources etc, but can also later be used with wireless tablets or IWB if these are introduced by the school.

Some of the more effective alternatives to IWBs are:

- a) A **Digital Projector used with a good quality wireless mouse** and keyboard in a classroom can achieve many of the benefits of an interactive whiteboard at a fraction of the cost. Interaction with the large screen image is done using the wireless mouse from anywhere within the classroom, and by pupils as well as teachers. Specialised mouse and keyboards combinations need to have a range of up to 10Metres to be effective from all areas in a classroom.
- b) **Wirelessly enabled 'tablets' or 'slates'** are available from a number of the IWB providers. Costs range from €300 to €450, and some providers allow the school to use the software throughout the school once either one tablet or IWB is purchased by the school. One advantage of the wireless tablets over the fixed IWB is that the teacher can themselves interact with the tablet from anywhere in the classroom, including from the back of the classroom. The tablet can also be used by pupils from their desks, or be passed around, without having to be 'up at the board'.
- c) **Infra Red whiteboard device add-on:** portable and low cost devices that attach to any standard whiteboard, connects to your PC and when used with a projector, allows you control your desktop applications and documents directly from the board. Cost start from €700.

Schools should ensure that they are aware of the alternatives listed here and that they are 'ready' to use the additional capabilities of the board.

NCTE recommends schools explore one of the above approaches before purchasing an IWB. If a school has already used these approaches and feels that the purchase of the board itself will provide additional benefits then it may be appropriate to purchase an IWB.

## Technical Considerations

To get an interactive whiteboard up and running, five separate components are involved:

- The interactive whiteboard itself
- A high quality digital projector (refer to advice sheet on digital projectors)
- A computer
- The software package including learning resources
- Physical connectivity between the computer, whiteboard and the projector.

The computer and the associated whiteboard software are fundamental to the process. The digital projector allows everything that is happening on the computer screen to be projected on to the whiteboard where everyone can see it. The touch-sensitive whiteboard allows users, either the teacher or students, to interact with the information being displayed, i.e., to interact with the computer. Generally speaking, marker pens (electronic or ordinary) are used as input devices, but some whiteboards allows users to use their fingers, as the pointing device, directly on the board.

### Types of Boards:

The surface of an interactive whiteboard is critical to its functionality and is a distinguishing factor between the different technologies used in the boards themselves. The interactive whiteboard captures the pen or user's finger inputs and detects where the user is touching the board, this information is then used as input to the computer running the interactive whiteboard software.

There are 3 different technologies used for this purpose, which are:

#### Resistive Membrane

The board surface incorporates a soft flexible vinyl or polyester-based plastic front surface and a rigid back board. The two layers of resistive material with a small gap between them create a touch-sensitive membrane, which is used to detect where a student or teacher touches the board. Applying pressure to the front surface (by using a pen or a finger) registers a contact point that is used as input to the interactive whiteboard software. Whiteboards based on resistive technology do not require special pens to write on the board, as ones finger can also be used.

#### Electro-Magnetic pick-up

These whiteboards are similar to traditional whiteboards in that they are quite rigid to the touch. The pens used with them emit a small magnetic field, which the board detects on pen impact or movement, and this information is then used as input to the computer running the interactive whiteboard software.

#### Infra-Red scanning

By attaching infra-red scanning devices to an existing ordinary whiteboard or flat surface the board is transformed from an ordinary whiteboard or surface to act as an interactive whiteboard. These scanning devices are light and portable and can be used with different types and sizes of ordinary whiteboards. Tracking of colour and patterns is based upon using special encoded pens, each of which has a uniquely encoded reflective collar that the board uses to identify its colour and position.

## Purchasing Considerations

The cost of an interactive whiteboard varies considerably and generally depends on the type of technology chosen, and on the size of the board. Of the types discussed above, the infra-red attached whiteboard is the least expensive, as it works with standard whiteboards.

When schools purchase an interactive whiteboard package they should check what software resources are being supplied with it. Software is generally included in the purchase price of the whiteboard, but it is necessary to check if this software allows users to:

- Draw or write on the board using different coloured pens or using ones finger.
- Print out and save the content to the attached computer
- Use "layering", "grouping" and other features which allow the user to create their own classroom resources, often with the help of an associated gallery.

Software can be a major differentiating factor in different products. Some suppliers supply specialised software packages to suit either Primary or for Post Primary schools.

Boards range in size from 35 inches (diagonal) to approx 80 inches (diagonal) and normally cost in the region of €1,500 - €4,000, including controlling software. Some boards can be fitted to a moveable stand, costing in the region of €300, enabling access in different locations, or can be wall-mounted. Generally the kit to do so is included in the price; however, installation and configuration of the board and projector could add another €500 to the overall price. If the school does not already have a digital projector, this can make the quite expensive as suitable projector prices begin at approx. €550, plus up to €300 for a replacement bulb. Some suppliers provide integrated, wall-mounted projectors, bringing the total cost to approx €5,000 (including installation and training). Given the price variations it is essential to seek best value by obtaining quotations from at least three providers. Note that these indicative prices do not include the price of the computer itself.

Infra-red Interactive whiteboards are the least expensive option. Such systems can be purchased for under €1,000, with the school providing its own standard board and projector.

#### **Other purchasing and technical support considerations:**

- Details of locally based technical support should be provided to handle any failures, support issues, queries, further training etc.
- The cost of all spares such as special pens should be clarified with providers, as spares can be costly.
- The boards themselves should be purchased with a 5 year warranty.
- The projectors should be purchased with a minimum 3 year warranty.
- The contract/warranty should include on-site repair or replacement of all faulty items including board, projector, wireless tablet and software within a certain time.
- The contract/warranty should include free software updates, as they become available from the provider.
- Providers should clarify the licensing arrangements once the school purchases an IWB, ie if the IWB software is available to be used on all other school PCs. This is an important point as some providers may restrict a schools use of the software to a particular PC or laptop.
- Providers should be asked if and how their product or software will work with IWB products from other providers, as this may be a consideration where a school has different types of boards.

#### **Additional Considerations**

The following relevant points should be noted when considering introducing interactive whiteboards to a school.

- Using an IWB may require a change in teaching methods to maximise the interactivity of the IWB.
- Interactive whiteboards should generally be located in classrooms, rather than in computer rooms.
- Teachers using the IWB should have adequate ICT & pedagogical skills to maximise the return on the investment otherwise they may prove to be a rather expensive projection screen, and thus poor value for money.
- Consideration will need to be given to providing additional training in addition to the initial training of how to use the board effectively
- Another area of consideration is the placement of the IWB and whether the board is to be fixed or mobile. Factors that will impact on placement will be if it will be shared amongst different teachers in different rooms. If so a freestanding mobile model may be required to enable movement within the school.
- The size of the board should be big enough so that all students to clearly see the board and should be height adjustable to enable all students and teachers to reach all parts of the board, especially at Primary school level. Boards need to be typically greater than 75 inches (measured diagonally).

- Schools should ensure that the software is supplied within the cost of the whiteboard and that this software is appropriate for the needs of the school and compatible with the computer in the classroom.
- Height adjustable model may be suitable for smaller children.
- Digital projector used with IWBs should generally be ceiling mounted.
- Teacher resources may also need to be redesigned to engage the interactive aspects of the board.

Interactive whiteboards create a range of learning opportunities for both students and teachers. Studies have found them to be highly motivating and learner-centred when integrated innovatively.

### Other relevant websites:

Becta Research

#### What the research says about interactive whiteboards

[http://partners.becta.org.uk/page\\_documents/research/wtrs\\_whiteboards.pdf](http://partners.becta.org.uk/page_documents/research/wtrs_whiteboards.pdf)

This document summarises Becta research on Interactive whiteboards

#### Drumcondra Education Centre's Interactive Whiteboard project

[www.cbiproject.net](http://www.cbiproject.net)

This is a portal site for Drumcondra Education Centre's whiteboard project, containing links to classroom resources, to suppliers, and pedagogical advice.

IWB link on Wikipedia

[http://en.wikipedia.org/wiki/Interactive\\_whiteboard](http://en.wikipedia.org/wiki/Interactive_whiteboard)

This is an information page on the Wikipedia website

IWB resources

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

Multimedia resources for use with an IWB

### Appendix 1

Appendix 1 contains a relevant article, written in 2008, by a teacher in an Irish primary school who has extensive experience of working with interactive whiteboards.

#### Introduction

Interactive whiteboards are a relatively recent technology and as a result of this much of what we know about them comes from research projects that have been undertaken by schools rather than referred literature in academic journals. The following article provides a brief summary of some of the major reports into the use of interactive whiteboards in primary schools. It is not intended as an exhaustive list of resources available.

To date, research has tended to agree with the general assumption that interactive whiteboards, when used efficiently, are a valuable asset to the primary classroom.

Recent research shows that the interactive whiteboard is considered to be more effective as a static fixture than as a mobile resource. (Smith, H., 2003).

It is agreed then that the positive impact of an IWB depends on the ways in which it is used.

#### Benefits

On the basis of analysis carried out for this report, interactive whiteboards can have positive impacts on teaching and learning in the areas outlined below. References for further reading are included at the end of the report.

#### General Benefits of IWBs

- Enable more varied, creative and engaging classrooms (Judge, M., 2007)
- Increase enjoyment and motivation

- Students are able to cope with more complex concepts as a result of clearer, more efficient and more dynamic presentation (Smith, H., 2001)
- Enable teachers to integrate ICT into their lessons while teaching from the front of the class (Smith, H., 2001)

#### **Benefits for teachers**

- The ability to save and print what is on the board, including any notes made during the lesson
- The wealth of resources available, the stimulating nature of the presentation and the flexibility that the technology offers. (Higgins et al, 2005)
- The benefit of being able to share and reuse materials
- Ease of use, benefit of a tool facilitating collective viewing (Cogill, J, 2002)

#### **Benefits for students**

- Increased motivation
- Accommodate different learning styles as teachers can call on a variety of resources to suit particular needs
- Quantitative results

The following is a summary of research provided by a team at Manchester Metropolitan University, as part of the DfES Primary Schools Whiteboard Expansion project. (Somekh, B)

In certain subjects, the more experience the teacher has of using the interactive whiteboard, the greater the likelihood of positive attainment gains for pupils:

- In Key Stage 2 maths, average and high attaining boys and girls who had been taught extensively with the interactive whiteboard made the equivalent of an extra 2.5 to 5 months' progress over the course of two years. There was less effect on progress for boys and girls of low prior attainment.
- In Key Stage 2 science, all pupils except high attaining girls made greater progress with more exposure to the IWB, with low attaining boys making as much as 7.5 months' additional progress.
- In Key Stage 2 English, the presence of an interactive whiteboard does not appear to have a significant effect on attainment, though further investigation with larger data sets is required.
- In Key Stage 2 writing, boys with low prior attainment made 2.5 months of additional progress.

#### **Considerations**

- Training in setting up and using the board and presentation software is essential,
- Training should be whole staff orientated to maximise a culture in which the IWB can become fully integrated.
- It takes time, it may take up to a year for the board to become fully integrated into teaching and learning in all classes. Developing multimedia teaching materials is a significant addition to workload in the early stages, though preparation time decreases once a range of materials exists. The expectations the whiteboards engender in students, however, put pressure on teachers to constantly improve the presentation and content of lessons. The capacity to share resources via the school network and internet could reduce workloads, but evidence suggests this is currently under-used (Becta.).

#### **Alternatives to IWB**

The interactive whiteboard can be an expensive 'blackboard' if not properly managed. An IWB cannot compensate for poor preparation or management of learning. Whiteboards "are tools and, like all ICT tools, they need committed, ICT literate teachers to facilitate and develop their use". Whiteboards should not be introduced into schools without careful consideration (at senior management level) of location, positioning, access and curriculum application. Initial and follow-up training for staff is essential. (Smith, H., 2001)

Some alternatives to IWB use include the following

- Wireless mouse and keyboard and projector
- Tablet PC's and a projector
- Interactive tablets and slates and a projector
- Wireless Projector Server and projector (Kent NGfI)

### Appendix Conclusion

From the research evaluated, it seems clear that the interactive whiteboard is widely considered to be a positive asset to the classroom. However, it is not without its problems. Technical support issues and a steep learning curve in the initial stages are factors that a school planning the purchase of an IWB should consider.

### Appendix 1 References

**Becta**, What the research says about interactive whiteboards.

[http://www.becta.org.uk/page\\_documents/research/wtrs\\_whiteboards.pdf](http://www.becta.org.uk/page_documents/research/wtrs_whiteboards.pdf)

**Cogill, J, (2002)** How is the interactive whiteboard being used in the primary school and how does it affect teachers and training?, King's College, London.  
[http://www.virtuallearning.org.uk/whiteboards/IFS\\_Interactive\\_whiteboards\\_in\\_the\\_primary\\_school.pdf](http://www.virtuallearning.org.uk/whiteboards/IFS_Interactive_whiteboards_in_the_primary_school.pdf)

**Higgins et al, (2005)** Embedding ICT in the Literary and Numeracy Strategies – Final Report, Centre for Learning and Teaching, Newcastle, [http://partners.becta.org.uk/upload-dir/downloads/page\\_documents/research/univ\\_newcastle\\_evaluation\\_whiteboards.doc](http://partners.becta.org.uk/upload-dir/downloads/page_documents/research/univ_newcastle_evaluation_whiteboards.doc)

**Judge, M., (2007)** Research on Interactive Whiteboard Technology, Education Matters, December 2007. <http://www.educationmatters.ie/2007/12/04/research-on-interactive-whiteboard-technology-launched/>

**Kent NGfI**, Alternatives to Whiteboards

<http://www.kented.org.uk/ngfl/ict/IWB/alternatives.htm>

**Smith, H. (2001)**. SmartBoard evaluation: 2001 Kent NGfI.

<http://www.kented.org.uk/ngfl/ict/IWB/whiteboards/index.html>

**Smith, H. (2003)**. SmartBoard evaluation: update Kent NGfI.

<http://www.kented.org.uk/ngfl/ict/IWB/whiteboards/update.html>

**Somekh, B.** DfES Primary Schools Whiteboard Expansion project (PSWE).  
([http://partners.becta.org.uk/index.php?section=rh&catcode=re\\_rp\\_02&rid=14422](http://partners.becta.org.uk/index.php?section=rh&catcode=re_rp_02&rid=14422))

### End of Appendix

*Note: While the advice sheets aim to act as a guide, the inclusion of any products and company names does not imply approval by the NCTE, nor does the exclusion imply the reverse. The NCTE does not accept responsibility for any opinions, advice or recommendations on external web sites linked to the NCTE site.*

This Advice Sheet and other relevant information are available at:

[www.ncte.ie/ICTAdviceSupport/AdviceSheets/](http://www.ncte.ie/ICTAdviceSupport/AdviceSheets/)