What the research says about interactive whiteboards

This report is based on an analysis of current research about the use of interactive whiteboards in teaching and learning. It summarises the key findings and suggests resources for further reading.

Contents

- **key research evidence on interactive whiteboards**
- **explanation of findings**
- **areas of further reading and investigation.**

Summary

Interactive whiteboards are appearing in an increasing number of classrooms. Although the technology is relatively new, there is an emerging body of literature on their effective use in teaching and learning.

Key benefits

- encourages more varied, creative and seamless use of teaching materials
- engages students to a greater extent than conventional whole-class teaching, increasing enjoyment and motivation
- facilitates student participation through the ability to interact with materials on the board.

How teachers can maximise the impact of interactive whiteboards

- invest time in training to become confident users
- explore the full range of capabilities of whiteboards
- collaborate and share resources with other teachers.

What is an interactive whiteboard?

An interactive whiteboard is a large, touch-sensitive board which is connected to a digital projector and a computer. The projector displays the image from the computer screen on the board. The computer can then be controlled by touching the board, either directly or with a special pen. There are a number of manufacturers of interactive whiteboards, offering a variety of specifications and capabilities at a range of prices.

Among the potential applications covered in this report are:

- using web-based resources in whole-class teaching
- showing video clips to help explain concepts
- demonstrating a piece of software
- presenting students' work to the rest of the class
- creating digital flipcharts
- manipulating text and practising handwriting
- saving notes written on the board for future use
- quick and seamless revision.

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Key research evidence about interactive whiteboards

On the basis of Becta's analysis, interactive whiteboards can have positive effects on teaching and learning in the areas outlined below. There are references for further reading supplied alongside most of the findings.

General benefits

- versatility, with applications for all ages across the curriculum *(Smith A 1999)*
- increases teaching time by allowing teachers to present web-based and other resources more efficiently *(Walker 2003)*
- more opportunities for interaction and discussion in the classroom, especially compared to other ICT *(Gerard et al 1999)*.
- increases enjoyment of lessons for both students and teachers through more varied and dynamic use of resources, with associated gains in motivation *(Levy 2002)*.

Benefits for teachers

- enables teachers to integrate ICT into their lessons while teaching from the front of the class *(Smith H 2001)*
- encourages spontaneity and flexibility, allowing teachers to draw on and annotate a wide range of web-based resources *(Kennewell 2001)*
- enables teachers to save and print what is on the board, including any notes made during the lesson, reducing duplication of effort and facilitating revision *(Walker 2002)*

- allows teachers to share and re-use materials, reducing workloads *(Glover & Miller 2001)*
- widely reported to be easy to use, particularly compared with using a computer in whole-class teaching *(Smith H 2001)*
- inspires teachers to change their pedagogy and use more ICT, encouraging professional development *(Smith A 1999)*.

Benefits for students

- increases enjoyment and motivation
- greater opportunities for participation and collaboration, developing students' personal and social skills *(Levy 2002)*
- reduces the need for note-taking through the capacity to save and print what appears on the board
- students are able to cope with more complex concepts as a result of clearer, more efficient and more dynamic presentation *(Smith H 2001)*
- different learning styles can be accommodated as teachers can call on a variety of resources to suit particular needs *(Bell 2002)*
- enables students to be more creative in presentations to their classmates, increasing self-confidence *(Levy 2002)*

- students do not have to use a keyboard to engage with the technology, increasing access for younger children and students with disabilities *(Goodison 2002)*.

Factors for effective use

- sufficient access to whiteboards so teachers are able to gain confidence and embed their use in their teaching *(Levy 2002)*
- use of whiteboards by students as well as teachers *(Kennewell 2001)*
- provision of training appropriate to the individual needs of teachers *(Levy 2002)*
- investment of time by teachers to become confident users and build up a range of resources to use in their teaching *(Glover & Miller 2001)*
- sharing of ideas and resources among teachers *(Levy 2002)*
- positioning the whiteboards in the classroom to avoid sunlight and obstructions between the projector and the board *(Smith H 2001)*
- a high level of reliability and technical support to minimise problems when they occur *(Levy 2002)*.

About Becta's 'What the Research Says…' series

This series of briefing papers is designed in particular for teachers, ICT co-ordinators and school managers, in order to provide an initial idea of the available research evidence for the use of Information and Communications Technology (ICT) in schools and colleges. We welcome feedback and suggestions for further titles in the series (contact details can be found at the end of this briefing).

Interactive whiteboards in practice

Matthew Pugh, a lecturer at Bournemouth and Poole College, has used interactive whiteboards with a variety of students, including those with a severe learning difficulty or disability. He has found that all students benefit from their interactivity and large screen size and have learned at a greater rate than those not using the whiteboards.

In particular, he identifies the power of images and the capacity for collaboration as significant in whiteboards' impact on learning, as in the following examples:

- A Bangladeshi student who never normally took part in class discussions was so inspired by the web-based images from her homeland that she used the whiteboard to present to her classmates for 15 minutes.

- A group planning a trip used the internet and the whiteboard's digital flipchart feature to find out costs and directions and write an itinerary. The whiteboard allowed the students to take control of their learning. At the end of the lesson the work was printed off, ensuring that each student had a record of their achievements.

Participation is further encouraged by the use of an infra-red keyboard which can be passed round the room. In this way all students can contribute, regardless of mobility. Matthew Pugh, however, notes that the novelty of using the technology can wear off so a range of approaches is necessary to maintain interest.

Explanation of findings

As with ICT more generally, positive impacts depend on the ways in which interactive whiteboards are used. Although the literature on this technology is still emerging, there is evidence of good practice and positive outcomes across the curriculum.

Glover & Miller (2001) identify three levels of whiteboard use:

- to increase efficiency, enabling teachers to draw upon a variety of ICT-based resources without disruption or loss of pace
- to extend learning, using more engaging materials to explain concepts
- to transform learning, creating new learning styles stimulated by interaction with the whiteboard.

While the efficiency of whiteboards is an important advantage – in one school, teachers found they could significantly increase teaching time *(Walker 2003)* – it is their use to extend and transform learning that results in the greatest gains. The literature gives numerous examples of such use in areas as diverse as literacy and numeracy *(Smith H 2001)*, modern foreign languages *(Gerard et al 1999)* and SEN *(Carter 2002)*.

Motivation

Increased motivation is seen as a key benefit of whiteboards. Reasons for this include:

- their presentational capabilities – incorporating websites and video seamlessly in teaching
- the high level of interaction – students enjoy interacting physically with the board, manipulating text and images
- the capacity to present and discuss students' work – focusing on student-originated material helps keep the class on task and raise self-esteem.

Allowing students to use the whiteboards so they engage with learning materials is therefore vital in increasing motivation and learning gains *(Kennewell 2001)*. Studies report that motivational gains diminish as the whiteboards become more familiar, although students tend to view their educational impact more positively the more they are used *(STCC 2002)*.

Demands on teachers

Teachers have found interactive whiteboards relatively easy to use but becoming confident in their use takes commitment in terms of both training and independent exploration.

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 *(Glover & Miller 2001)*.

Practical issues

Teachers are hesitant about changing their pedagogy to incorporate interactive whiteboards if practical considerations hinder their use. Key factors include:

- ease of access – the whiteboards need to be a regular part of classroom practice if they are to be fully exploited *(Greiffenhagen 2000)*
- reliability – studies report varying, though generally high, levels of reliability; the role of whiteboards in lesson delivery means it is essential that teachers have confidence in the board, its network connection and the provision of technical support
- visibility – problems can occur where sunlight shines directly onto the board *(Levy 2002)*
- positioning – the board should be mounted at a suitable height and the computer and projector positioned to minimise the risk posed by trailing wires *(Smith H 2001)*.

Research suggests that consulting teachers at an early stage can reduce practical difficulties and ensure the technology meets the school's pedagogical needs.

Value for money

The cost of interactive whiteboards makes value for money an important consideration. It is only when used to extend and transform learning that they justify their cost relative to cheaper solutions such as plasma screens or data projectors and conventional boards. Research indicates that while some teachers are making full use of interactive whiteboards, this is not yet generally the case. In one study *(Glover & Miller 2001)* teachers were equally enthusiastic about lower-cost options.

Key areas for further research

As interactive whiteboards are still relatively new, more research, both quantitative and qualitative, is needed on all aspects of their use. Most of the research has so far been conducted in schools where whiteboards are still quite new to both the teachers and the students: further studies will be needed to re-assess their impact once they are embedded in classroom practice and no longer felt to be a novelty.

To ensure schools make the right choices and get value for money, it would also be useful to assess the advantages and disadvantages of interactive whiteboards in relation to lower-cost solutions and other emerging technologies such as tablet PCs.

About the research literature

As interactive whiteboards are a relatively recent technology, there is not a great deal of literature relating to them in refereed academic journals. However, there are a number of research projects that have been undertaken by schools and Local Education Authorities, reports from which are often available on the internet. Much of the evidence in this report is taken from such studies. These projects often include surveys of teachers' and students' perceptions of interactive whiteboards.

The number of articles in the educational press and even national newspapers also shows the high level of interest in interactive whiteboards, though these articles tend to focus on anecdotal evidence and advice. It should be noted that the majority of this coverage presents a very positive view of interactive whiteboards, though as each school's needs are different, it is important to exercise judgement in assessing the wider applicability of such evidence.

It seems certain that the amount of academic research on whiteboards will increase over the next few years. This report should therefore be seen as a snapshot of the current research literature and a starting point for further investigation.

Key questions for schools

- Have your school's teaching needs been taken into account when considering the purchase of interactive whiteboards?

- Is there sufficient training and technical help to support the use of interactive whiteboards?

- Have you considered the practical issues of location, positioning and health and safety?

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Becta's ICT Research Network

If you're interested in research on the use of ICT in education, you can join Becta's ICT Research Network.

The ICT Research Network seeks to encourage the exchange of information in order to inform the national agenda and professional practice.

Membership is free and is open to:
- teachers
- ICT advisors
- researchers
- research sponsors
- ICT co-ordinators
- school managers
- policy makers
- industry.

The Network provides them with an opportunity to:
- exchange information on current research
- develop partnerships
- discuss priorities for further investigation
- focus research on issues of importance to practitioners and policy makers.

They can do this via:
- an e-mail discussion list
- publications
- conferences and events.

More information on Becta's ICT Research Network can be found at: **www.becta.org.uk/research/ictrn**

Alternatively, e-mail: ictrn@becta.org.uk or write to: Michael Harris, ICT Research Network, Becta, Millburn Hill Road, Science Park, Coventry CV4 7JJ

www.becta.org.uk/research

About Becta

Becta is the Government's lead agency for information and communications technology (ICT) in education and supports UK Government, national organisations, schools and colleges in the use and development of ICT in education to raise standards, widen access, improve skills and encourage effective management.

About the ICT in Schools Programme

The ICT in Schools Programme is the Government's key initiative to stimulate and support the use of information and communications technology (ICT) to improve standards and to encourage new ways of teaching and learning. The enormous potential of ICT means that for the first time it is becoming possible for each child to be educated in a way and at a pace which suits them, recognising that each is different, with different abilities, interests and needs. The challenge over the next four years will be to successfully embed ICT in every facet of teaching and learning where it can directly impact on raising standards of attainment. A vision for the future of ICT in schools can be found in the paper *Fulfilling the Potential - Transforming Teaching and Learning through ICT in Schools*, available on the DfES ICT in Schools website **http://www.dfes.gov.uk/ictinschools/publications/**

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