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Interactive whiteboards and schooling: the context

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This paper seeks to set the scene for the ensuing articles in this themed issue by placing the recent developments with interactive whiteboards (IWBs) in their historical context. It argues that use of this instructional technology has already had a profound impact upon teaching and highlights the importance of educational researchers considering both the micro and the macro context when they explore the impact of any instructional technology use. The paper moreover suggests that the IWB is emerging as the second great revolutionary instructional technology and is shaping as the development that is fundamentally changing the nature of schooling, moving it from its traditional paper-based form to digitally based organisation. The author’s provocative stance stems from a perspective of directing and networking schools. Many of the subsequent papers elaborate examples of IWB use in classrooms, helping the reader to evaluate the argument using recent empirical research.

Keywords: interactive whiteboards; research; context; impact

IWBs and schooling: the context

The signs in 2009 are that the humble interactive whiteboard (IWB) is shaping as one of the more significant developments in the history of schooling. Based on my research and experience as a director of schools I have argued elsewhere that within less than a decade use of this technology has had a profound impact across the developed world on teachers’ preparedness to move from the traditional paper-based teaching materials to those that are predominantly digital, and to normalise the use of the digital in their everyday teaching. In turn schooling is moving from its traditional paper-based operational mode to one that is digital (Lee & Gaffney, 2008) and networked (Lee & Finger, 2010).

Virtually overnight the total teaching staff and the students within some identifiable ‘pathfinding schools’ – namely those early adopter schools showing the way forward – appeared to embrace the use of IWBs, with a level and speed of takeup not previously evidenced (Lee & Winzenried, 2009) with any other electronic instructional technology, moving the school into a fundamentally different operational mode (Lee & Gaffney, 2008). Research involving the author (Lee & Boyle, 2003; Lee & Winzenried, 2006, 2009) identified schools in Australia, New Zealand, the UK and the USA where all of the teachers in the school were using IWBs, and importantly the complementary digital technologies, in their everyday teaching within two years of the board’s introduction. In one instance the school achieved whole-staff usage within three months (Lee & Winzenried, 2009, pp. 205–207). So rapid was the teacher

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acceptance of this digital technology in these schools, particularly when compared
to the level of usage of all previous electronic and digital technology, that I used
the term ‘digital take off’ to describe the transformation. Where prior to the introduc-
tion of the IWBs only 20–30% of the teachers were using ICT regularly in their
teaching, very soon 100% were using the digital resources. While in the mid-2000s
there was only a handful of these schools and today they are still in the minority, they
are rapidly growing in number, possibly at a rate akin to the whole-school acceptance
of IWBs.

The early indications, reinforced by recent research examining the movement of
pathfinding digital schools, where the use of the digital is normalised in everyday
teaching (Lee & Gaffney, 2008), to the networked operational mode where the schools
are using their digital and network technology to operate outside the traditional school
walls (Lee & Finger, 2010), are that history will show the IWB to be a key variable in
changing the fundamental nature of schooling. It is increasingly evident that when
organisations, be they banks, insurance companies or public service departments, go
digital and shift away from their paper base they undergo significant and importantly
ongoing internal change (Hesselbein & Goldsmith, 2009). This holds equally for
schooling. While most schools have, since the 1990s, made increasing use of the digi-
tal in their administration and finance, the teaching remained predominantly paper
based until recently. However once all teachers normalised the use of the digital in
their classrooms, so the school as a whole unwittingly began operating increasingly
within what Lee and Gaffney term a ‘digital operational paradigm’ (Lee & Gaffney,
2008, p. 13). The data, discussed more fully below, reveal that it has been the IWB,
the digital facility that all teachers from pre-school to high school can use with their
classes, that constitutes the key agent of change and not the personal computer which
Larry Cuban rightly identifies in his book title as being *Oversold and underused*
(Cuban, 2001).

What is important in an organisation moving to the digital mode is the normalisa-
tion of the digital by the total staff and not how well the staff use the technology
(Hesselbein & Goldsmith, 2009). In preparing the recent ACER Press publication with
Chris Betcher on the classroom use of IWBs, we very consciously titled the work *The
interactive whiteboard revolution* (Betcher & Lee, 2009), aware that research and
experience were already revealing the ‘revolutionary’ impact this technology had had
upon teacher, student and whole-of-school normalisation of digital technologies in
teaching and ultimately the school as an organisation. Originally Lee and Boyle
(2004) used the term ‘revolution’ in relation to findings of the research they undertook
in 2003 in a socio-economically disadvantaged school in Canberra, Australia that
underwent a dramatic transformation after introducing IWBs throughout. Six years on,
and after further research into the use of all manner of instructional technology over
the last century (Lee & Winzenried, 2009) and a recognition of the failure of all the
twentieth-century technologies (even the four-function calculator) bar the IWB to be
normalised by total teaching staffs, it appeared valid to describe the change as
revolutionary.

Coulson (2006, p. 5) makes the observation that the first revolutionary instruc-
tional technology was that introduced in 1801, the blackboard (Lee & Winzenried,
2009, p. 37). Ironically that technology became so pervasive and its use so normalised
that it rarely warrants any mention in the education literature (Lee & Winzenried,
2009, pp. 37–41). It has taken 200 years for that technology to begin to be superseded
by another whole-of-class technology that all teachers are prepared to use every day.
Participation as a Keynote Speaker at the International Conference on the use of whole-class interactive technologies (RITWIT 2009, Cambridge, UK, see http://www.educ.cam.ac.uk/events/conferences/ritwit/), on which this collection of papers is based, provided the chance to reflect upon the research undertaken thus far on IWBs and to underscore the fundamental importance of addressing context in researching the impact of any technology. An analysis of the research over the last 50 years on the use of instructional technology (Lee & Winzenried, 2009; Saettler, 1990) reveals a marked propensity to focus on the micro, often neglecting to position that thinking within its macro context. While there is much excellent and valuable research being undertaken on the micro scene on the ground, on the use of IWBs within the classroom – as evidenced elsewhere in this themed issue – there has been remarkably little written on the macro aspects, the changing shape of the forest and the ever-evolving nature of schooling and the technology therein.

It came as a major surprise when embarking on the quest to examine teacher and student use of instructional technologies in schools in the last century to discover how little has been written on the history and evolution of digital technology or indeed its use by teachers and students. Saettler (1990) provides a comprehensive coverage of technology up to the late 1980s but spends little time examining its use by teachers. Cuban (1986) addresses that shortcoming at least in the US situation up until the mid-1980s but there was no comprehensive study of the rapidly evolving digital and networked instructional technology in use from the mid-1980s onwards (Lee & Winzenried, 2009).

In an increasingly networked world, where digital convergence is hastening the integration of operations, breaking down the traditional segmented division of labour (Friedman, 2006) and removing so many of the traditional organisational boundaries (Hesselbein & Goldsmith, 2009; Lipnack & Stamps, 1994), it is vital that the research consistently bears in mind the total educational environment, the interrelatedness of the parts and the ongoing change. Digital integration is already having a profound impact on the organisational structure of schools with the old clearly delineated division of responsibilities being replaced by executive positions with whole-of-school responsibilities: positions like director of learning, network manager and director of information services. When the one powerful integrated database can handle the school’s administration, accounts, communication, website and instructional programmes, one has no need for the traditional separate programme managers and faculty heads.

One of the largely unheralded and increasingly used capabilities of the IWB is its digital integration, the way in which it can be used as a large-screen digital convergence facility, as a digital hub (Betcher & Lee, 2009, pp. 12–13) to give added potency to previously peripheral technologies like scanners, digital microscopes, card readers, digital cameras and Skype. That facility has had a marked impact on the shift from discrete to increasingly integrated technologies (Lee & Winzenried, 2009) and the associated importance of the research considering the impact of the integrated entity.

In an era of such rapid technological development it is also important to place the research in its historic context even when the history might on first glance appear so recent. The changes in instructional technology in the past 15 years, indeed past five years, have been immense. The key is to bear in mind the trend lines and the finite life cycle of all instructional technologies (Gartner Consulting, 2008; Lee & Winzenried, 2009, pp. 192–208). Few digital technologies will survive without model updates.
every couple of months. All ultimately will be replaced with the market determining when they will be superseded. The researching of an ever-evolving suite of integrated technologies, where parts will soon be outmoded, presents previously unencountered challenges for research.

Allied is the necessity of considering the geographic and the political contexts, of appreciating the often very considerable variability between situations, but on the other hand the significant commonality of those experiences that transcend geographic and cultural divides (Tapscott, 2009). The research literature invariably makes little reference to the political forces that impact on the choice, deployment and use of the instructional technology – whether those forces be the large ‘p’ – political intervention driven by a government’s particular approach or allocation of monies or the small ‘p’ – political influence exercised by the major multinational technology corporations (Lee & Winzenried, 2009, pp. 25–33). All of these situations are likely to impact in some way on any research on IWBs and the board’s impact on teachers, teaching, students and schooling in general.

**Historical context**

In considering the historical context, it must be recognised – as mentioned above – that no electronic instructional technology was used consistently by a majority of teachers, let alone all of the teachers, in a school in the twentieth century (Lee & Winzenried, 2009) and that it was not until around 2002–2003 that pathfinding schools using IWBs succeeded in getting all their teachers to use digital technology in their everyday teaching. It is easy to forget that until the data projector and the IWB reached a level of technological maturity and a price point in their life cycle where schools could consider deploying them school-wide, teachers had no realistic means of using the digital technology in normal class teaching. The personal computer was designed for personal and not class use. That maturity and price point were not reached with the data projector and IWB until around 2002. The widespread use of IWBs in schools, and in turn the normalisation of the digital in everyday teaching, is thus very recent, and as will become apparent when one considers the global situation described below, is still largely restricted to the pathfinding schools and education authorities.

As Lee and Winzenried (2009) indicate, the most commonly used instructional technologies in the classrooms of the developed world in 2008 were the pen, paper and the teaching board – be it black, green or white. The sales figures for IWBs reveal that while the 2002–2003 numbers were significant it was not until around 2005 that the numbers began to rise at pace. Globally the sales of IWBs tripled between 2005 and 2009 from one quarter to three quarters of a million, and figures are forecast to be almost a million boards in 2010 (Futuresource Consulting, 2010). While the sales globally are clearly continuing to escalate, IWBs are still to be found in only 7% of classrooms overall, however.

Allied to the acquisition of the IWBs was the preparedness of teachers in schools to use this technology in their everyday teaching. Why that is so needs further research but the small-scale research undertaken by the author points to the teachers’ belief in the educational worth of using the technology and their comfort in using it within their everyday teaching being vital factors (Lee & Winzenried, 2009, pp. 175–183). The contrast between the teachers’ acceptance of IWBs and diffidence in using PCs in class is pronounced. This was a historic first in the use of electronic instructional
technologies. Principals had finally to contend with teachers clamouring to use a technology. The UK Becta review of 2007 observed:

This sharp rise in the use of ICT resources in the curriculum has been driven to a large extent by the adoption of interactive whiteboards (IWBs) and related technologies. Interactive whiteboards are a popular technology, in heavy demand by schools and practitioners. They offer transparent benefits to learning and teaching. That is, it is easy for institutions and teachers to recognise how IWBs enrich and enhance learning and teaching – something which may not always be so immediately transparent to practitioners in the case of other technologies. (p. 66)

While not for a moment suggesting that all teachers embraced the IWB, their takeup far surpassed that of any earlier electronic technology. The recency of teacher use of IWBs is important to note, particularly when considered in light of Naisbitt’s astute observation (1984) that all new technology will be used initially to try and better perform the ways of old and that time – and indeed appropriate support – will be needed before the technology is used in fundamentally different ways. The case studies in which the author was involved exemplified this propensity (Lee & Boyle, 2003; Lee & Winzenried, 2006). Teachers need time to become confident and competent in using the tools before they use it in new ways in their classrooms.

The 2002–2003 takeup of IWBs occurred, not surprisingly, at the same time as – and in many senses as part of – the ‘Triple Convergence’ that Thomas Friedman (2006) identified in his The world is flat as a fundamental turning point in the history of the world: the convergence of major technological developments that have fundamentally changed the nature of business and indeed lives around the world.

Geographic context
The changes in the pathfinding schools occurred across the developed world, in both education authorities that actively supported the introduction of IWBs and those that offered little or no encouragement. The key was the quality of a school’s leadership (Lee & Winzenried, 2009, pp. 237–240). What however the figures reveal is that the shift to the widespread use of IWBs was greatest in those situations where the local authority funded the acquisition of the boards and the provision of the requisite support. The UK led the way with its immense government support and the proportion of classrooms there with IWBs installed now sits at over 70%. Those figures still far exceed those of any other nation (see Figure 1).

Mexico, where the national government also provided immense financial support, was the next great mover, and today around 28% of its classrooms have an IWB. It has relinquished its 2008 number two position, however, to Denmark and the Netherlands (40–42% penetration) who have both made very dramatic levels of investment over the past year. Next in the proportion of the nation’s classrooms with IWBs come Australia, the USA and Ireland, with each having climbed to just under 30%. The schools have led the takeup of IWBs in those three countries, with scant support from the national government; indeed in Ireland it is claimed that 90% of boards are paid for by parents’ fundraising efforts.1 Of note is that while these three developed nations have attained this level, comparable nations fall well below (see details in Figure 1).

The IWB industry works on the assumption that once a nation has around 3–4% of its classrooms with IWBs (the ‘tipping point’), the takeup will then grow at pace (Futuresource Consulting, 2010). That is indeed what the international trend line is
showing with both Europe and East Asia projected to surge in the use of IWBs in the next three years. Globally sales of IWBs are projected to be 1,350,000 by 2012 (Futuresource Consulting, 2010). Of note is that the world financial crisis has had little impact on the takeup and teacher acceptance of IWBs.

Educational context

Teachers appear at this stage in the history of the IWB to be using the technology to try and improve the ways of old, with there being only early signs to suggest that using the boards may assist directly in enhancing student attainment. If anything the current situation points to it being a number of years before the quality of teacher use of IWBs will significantly improve that attainment. Naisbitt’s (1984) not unreasonable hypothesis indicates that it will take time before the technology is used to teach in fundamentally different ways. Conscious of most teachers’ newness to the use of any digital technology and an appreciation that the vast majority of schools and education authorities are only now becoming aware of what is required to support teachers operating within a digital and networked mode, that timespan could be considerable. One could, based on the research on the centrality of quality teaching in improving student attainment (Barber & Mourshed, 2007), hypothesise that it will not be until the vast majority of the teachers in a school, and eventually a nation, are using the digital technology effectively, and in a significantly different way to the old, can marked improvements in student attainment be expected.

In researching The interactive whiteboard revolution (Betcher & Lee, 2009) I found in the case studies and school visits that teachers initially maintained their existing pedagogical style with the IWBs. There were teachers employing the full spectrum of approaches from the strongly teacher-centric to strongly student-centric. In time, usually after about a year when the teachers felt comfortable with the technology, there was evidence of teachers beginning to explore new ways of using the technology, most notably by using boards as digital hubs. What was apparent was that the nine variables Lee and Winzenried identified (2009, pp. 217–244) for the successful total school use of digital instructional technology – factors like teacher acceptance, classroom availability, ongoing in-house support and development,
quality infrastructure, funding and most importantly quality leadership – held true for IWB usage as well. Unless those human and technological variables are addressed successfully there is little likelihood of sustained total staff or student use of the boards, and the follow-on benefits. Indeed the early evidence suggests that the school will revert to a paper-based operation if those variables are not addressed astutely (Lee & Winzenried, 2009).

Impact of IWB use

Educationally, what using the IWB has done in schools where the aforementioned variables are successfully addressed is to facilitate the shift of a vast and rapidly growing number of teachers from paper-based to predominantly digitally based teaching, and in turn to assist those teachers’ schools in going digital. IWB use has, very importantly, also opened the way for students in those schools to use digital technology in their everyday classroom learning. This is a vital facet that needs further research. What is often overlooked is that if teachers do not use the technology in their teaching they will also prevent student use. What became apparent in researching a recent publication (Lee & Finger, 2010) is that the classroom is the one situation where the young person’s use of the digital has to be overseen by a teacher.

Allied to the widespread teacher usage of IWBs is the seeming emerging trend for teachers to use the proprietary software (SMART Notes/ActivInspire) as their core applications software. While at this stage the evidence is anecdotal and further research is needed, it appears that the IWB proprietary software is displacing Microsoft Office as the core ICT application and relegating the other digital resources, including learning platforms, to a supplementary role.

The educational impact of the IWB thus far has probably more to do with teachers’ and schools’ willingness to use the boards than the quality of the use. The whole-school teacher and student acceptance and use of the boards, the movement from paper-based to digitally based teaching, the attractiveness of the boards to the students, the enhanced student attendance and probably improved student behaviour (Lee & Winzenried, 2009), the significant improvement in teacher efficiency (Becta, 2007, p. 48) and the movement of schools towards the digital operational mode all have more to do with normalised use rather than the quality of the use. Enhancing the quality of teacher and student usage is the next major challenge.

The research

While the research and data reveal that the IWB has had, and is having, a profound impact upon teaching across the world, and while the boards are playing a major part in shifting schooling from its traditional paper-based mode to one that is more digital and networked, much more needs to be done. Most importantly, researchers and education authorities have to better communicate the findings of the research and find ways for those findings to inform classroom practice.

More attention does need to be given to the conditions that impact on student learning and teacher performance, rather than simply seeking to identify a nexus between the technology and student learning. Student learning, as we know, is impacted by many variables, and it is immensely difficult to ascribe an improvement in learning to a particular technology – particularly one as multifaceted as an IWB. Much however can be learnt by researching the key preconditions that are known to
impact on the learning, factors like student attraction, attendance and behaviour, and
the variables that will influence the teacher’s capacity to get the most out of the tech-

ology, variables like teacher readiness, professional support, mentoring and training, indeed resourcing.

As will be evident by the limited reference to other sources, far greater research
needs to be undertaken on the impact of schools as organisations going digital, and in
turn networked, and what the likely ramifications are of that shift on the nature of
teaching, the resources employed, the funding and support provided and the role to be
played by parents and indeed the young ‘digital natives’.

Conclusion

The idea that a mere piece of instructional technology could have such a profound
impact on teaching, and indeed the nature of schooling, within such a short period, is
a contentious one. However on reflection the teaching board has had that impact on
classroom teaching for two centuries. The personal computer has reshaped myriads of
businesses. It is thus not that unreasonable to suggest that the one digital instructional
technology that the main manufacturers designed for use by teachers (although
initially purchased mainly within the business sector as a presentation tool), the IWB,
should have a comparable revolutionary impact (Lee & Winzenried, 2009, p. 166).
The proposition does need to be tested at both the micro and macro level, but also
borne in mind by all researching the use and impact of whole-class interactive
instructional technologies.

Note


Notes on contributor

Mal Lee is an educational consultant and author specialising in the use of digital technology in
schooling, particularly by the school leadership. A historian by training, he is a former director
of schools, secondary college principal, technology company director and a member of the Mayer
Committee that identified the Key Competencies for Australia’s schools. In 2009 Mal co-authored
with Arthur Winzenried The use of instructional technology in schools – Lessons to be learned,
and with Chris Betcher, The interactive whiteboard revolution – Teaching with IWBs.

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