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"Interactive Whiteboards and English Teaching: A consideration of typical practice"

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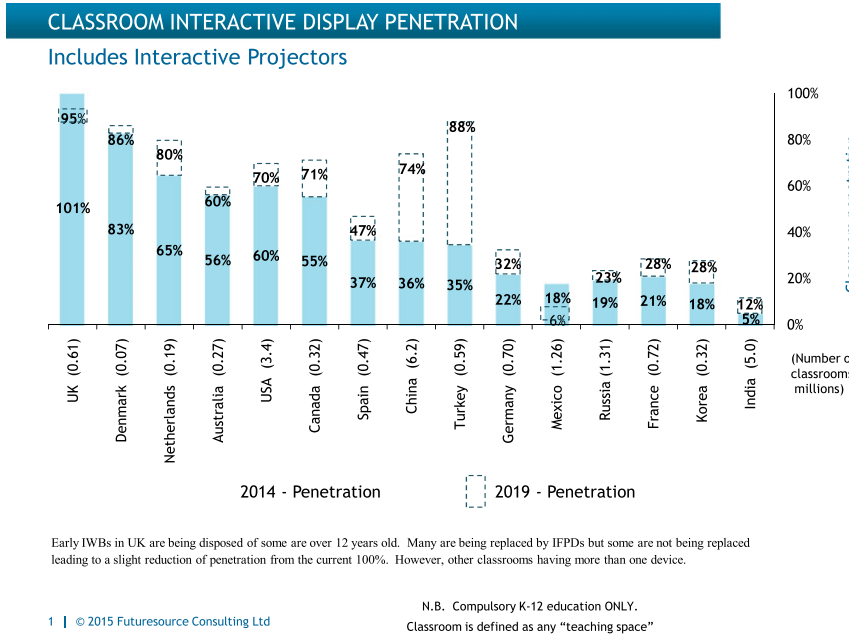
Abstract
This article considers the affordances of interactive whiteboards (IWBs) for English teachers by reflecting on the typical use of IWBs by a number of sec-ondary English teachers who use them routinely within their teaching. Drawing on a PhD study, it looks at the practice of these teachers and considers when the technology is used within lessons, in terms of lesson timing and the stage of teaching. It also draws attention to two particular areas: the most commonly used programmes observed and the use of handwriting on the IWBs. From the patterns of practice that emerge, it is clear that teachers require continuing pro-fessional development in order to understand and use the technology effectively.

Keywords
interactive whiteboard, affordance, technology, technological pedagogical content knowledge (TPACK)

Introduction

Introduced to secondary schools towards the end of the 1990s (Greiffenhagen 2000), interactive white boards are now a commonplace piece of classroom technology, with the UK leading the world in terms of IWB penetration of classrooms (Figure 1). Acting like a ‘digital hub’ (Betcher and Lee 2009 p.12), they have a multifunctional capacity including a touch-sensitive board which can be operated (depending on brand) by finger, pen or peripherals such as keyboard.

Figure 1: : Classroom interactive display penetration (Messenger 2015)



The spread of IWBs has been regarded as 'technology-led' rather than 'education-led' (Mercer 2010, p.xv): the availability of the technology, fuelled by 'political rhetoric' (ibid.), led to its adoption before its educational usefulness had been fully demonstrated. In the case of secondary English teaching, it is probably true to say that there has been a variable and sometimes uneasy relationship between English and information and communication technology (ICT) (Scarratt and McInnes 2009). Any uncertainty about the role of ICT in English is exacerbated by a revised national curriculum which makes no reference to the use of ICT in English (DfE 2013).

However, there is an acknowledged imperative to provide learners with a critical awareness of information and communication technologies (Daly 2011). IWBs, in particular, reflect the wider cultural shift from page to screen technology (Kress 2003). With its large screen and capacity for colour, images and movement, the IWB is a multimodal technology with an emphasis on the visual in particular and, as Kress points out, 'The world told is a different world to the world shown' (Kress, 2003, p.1). Modality affects the message, and English teachers – teachers of language and communication – need to understand the different options and possibilities – the affordances - of multimodal technology such as IWBs for the effective teaching of English.

Gibson, who coined the term, explained that an 'affordance' is what something 'provides or furnishes' to an observer (Gibson 1986, p.127). He was

considering what something affords the observer rather than the qualities of that something. The affordances offered may or may not be obvious to the observer but they require 'ambient light' to be perceived properly (ibid. p.140). This article will begin to explore the affordances and will also question whether teachers have the necessary 'ambient light' to appreciate the affordances.

Historical context

As Figure 1 indicates, IWBs have become a common piece of technology in schools. Their widespread adoption may be partly explained by their emergence at the same time as the National Literacy Strategy (NLS) (DfEE 1998) was being rolled out in primary schools. The NLS had a direct impact on pedagogy by prescribing the structure of the teaching sequence, particularly the newly introduced 'literacy hour'. Similar approaches were subsequently introduced to secondary schools in the form of the Key Stage 3 Strategy (DfEE 2001). Strategies included more shared (whole-class) reading and writing, as well as greater whole-class interaction, approaches which appeared to be supported by IWB use. The intent of using technology to transform learning was made clear in the title of the government's strategy document: Harnessing Technology: Transforming Learning and Children's Services (DfES 2005). However, the anticipated transformation proved elusive. Becta (the former government agency which supported technology use in schools) acknowledged that, whilst there were 'indications. . . of positive impact [of IWBs] on learning', these were limited (Becta 2006, p.12). This was echoed by research: a study of 184 primary school lessons over a period of two years claimed that, whilst commentators have been 'seduced by the technology', their findings show that 'traditional patterns of whole class interaction persist' (Smith, Hardman and Higgins 2006, p. 455).

A body of research has emerged relating to literacy teaching at primary level (for example, Wood and Ashfield 2008; Gillen et al. 2007; Somekh et al. 2007; Cogill, 2003) but there have been few studies focusing purely on the use of IWBs in secondary English classrooms. Moss et al. (2007) considered IWB use in the core subjects (English, mathematics and science) in relation to the introduction of IWBs as part of the London Challenge initiative. They found that English departments were often equipped after mathematics and science departments. In accounting for this difference, they suggest that the visualisation of ideas allowed by an IWB might be more appropriate to mathematics and science than to English, and that the capacity for the IWB to inject pace into a lesson might be more suited to mathematics than English. Bodies of research have arisen around both mathematics (for example, Miller and Glover 2007; Davison and Pratt 2003) and science (for example, Hennessy, Deaney and Tooley 2010; Beauchamp and Parkinson 2005) in a way that has not hitherto happened with English, leading to a perception perhaps of English lagging behind other core subjects in the effective adoption of this technology.

The aims and scope of the study

The PhD study which this article draws upon seeks insight into how a range of teachers use IWBs. It aims to capture something of the ordinary, routine use of IWBs in classrooms. The results of these case studies are not necessarily generalisable, but they indicate possible threads of enquiry into the use of IWBs generally, and in their use in the English classroom more specifically. Examining how the IWB is being used in a limited number of classrooms allows questions to arise about how it is used more generally in secondary English teaching. Considering how IWBs are being used also draws attention to how they are not being used, which this article will also consider.

Seven case study teachers, from four urban/suburban schools in the West Midlands of England, participated in the study. The teachers had different levels of experience, ranging from one with 18 years' teaching experience to another in her first year as a qualified teacher. The factor common to all teachers was that they used an IWB routinely within their teaching of English. The teachers were selected as working in schools within my professional working environment as a teacher educator, and were recommended by fellow practitioners as being routine users of IWBs. In order to capture usual, routine practice, I deliberately avoided 'Missioners', the type of teacher identified by Glover and Miller (2001, p2) as having a keen enthusiasm about using and promoting technology, as Missioners may present exceptional rather than routine use of the IWB.

Methods

Data was collected by means of classroom observations, content analysis of IWB content and interviews with the teachers. In total, sixteen lessons were observed across Key Stage 3 and Key Stage 4 classes. The content used on the IWBs in fourteen lessons was analysed. All seven teachers were interviewed about their use of the IWBs in the observed lessons as well as about their general experience of using IWBs.

To gather data on the use of IWBs in the sixteen lessons, I used systematic classroom observation, a quantitative method where a 'systematic set of rules' (Croll 1986, p.1) determines the recording of events in the classroom, and a coding system allows for subsequent analysis of the data gathered. A series of observations relating to the use of the IWB was recorded for each minute of the lesson, in order to collect data to answer questions on the timing of IWB use, the users, the audience and the functions served by the IWB.

The content of the IWB itself was recorded by a 'Flip' (small digital video) camera recording the PC screen connected to the IWB. Content analysis was used to examine the data, following an approach taken by Bell (2004) to quantify observable content into distinct categories. Variables were set up to enable categorisation of the content, and values were listed for each variable. Incidences of the values for each variable were counted. For example, the type of programme was a variable and one slide from a PowerPoint presentation was

a value to be counted. This quantitative method was employed to address questions on the nature of the content (for example, the programme used) and the pedagogical purposes of the content (for example, which English skills were the focus of use).

The teacher interviews were semi-structured, and screen prints of key screens observed in the lessons were used as prompts to discuss practice and teaching strategies. Whilst the interviews focused mainly on the lessons, the teachers were also asked to discuss their wider experiences of using IWBs for teaching English and in particular their training for using IWBs.

Findings

The study elicited data and discussion over a broad range of areas relating to IWB use in English teaching, including teacher attitudes, teacher control, student use, programme(s) and applications, resource preparation, interactivity, multimedia potential, training and areas of the English curriculum where IWBs are used. However, for the purposes of this article, I will focus on three key areas chosen as areas that may influence a fundamental understanding of important factors relating to the use of IWBs in English teaching. Firstly, I will consider when the IWBs were used in the observed English lessons. Then I will draw out two areas of affordance and constraint that I consider may be of particular interest to English teachers in general:

- the core or mainstay programme(s) used by the teachers
- the use of handwriting on IWBs.

When are IWBs used in English?

The IWBs were switched on all of the time in the lessons I observed. This may well be related to the fact that I was specifically observing IWB use, but it con-curs with findings elsewhere that IWBs are 'rarely totally ignored' when they are present in a classroom (Moss and Jewitt 2010, p.31). However, what may be surprising is that IWBs were contributing to the lesson for 95% of the obser-vations I made; 44% of my observation counts showed that IWBs were the main focus of the lesson and for much of the rest of the time (51%) they con-tained relevant materials in the background. This suggests both routine and well-established use of the IWBs within the case study teachers' lessons. It also indicates that the IWB has become both a usual and a significant element of the teachers' practice.

The collected data provide information on when the IWBs were being used in lessons, through exploring the type of IWB use within ten-minute sections of lessons. This reveals that the IWB was the main focus of the lesson, particularly during the first part of the lesson. 28% of observations showing the IWB as the main focus were during the first ten minutes, followed by 27% in the second ten-minute section. This indicates that the teachers use the IWB as a focal point

Table 1: The number of counts indicating the type of text preparation noted in each 10 minute section of the lesson

Resource type	No. of counts	Percentage (of total no. of counts)
Electronic notebook/flipchart (ENF)	59	29.1
PowerPoint	107	52.7
Word document	1	0.5
English specialist programme	7	3.4
Games	9	4.4
DVD video	3	1.5
Internet pages	2	1.0
Timer	3	1.5
Name chooser	11	5.4
Register	1	0.5
TOTAL	203	100

for the start of the lesson. It was also noted that the content used on the IWB during the first third of the lesson was mostly completely prepared (Table 1). Teachers possibly find planning for the first part of the lesson easier than for later episodes in the lesson, which are less easy to predict and prepare for; but, in general in this study, the IWB appears to be associated with prepared resources and with prepared learning, rather than with the spontaneous creation of resources or the extemporary exploration of ideas and learning. Indeed, although one teacher described the IWB as 'a Godsend' for supporting unplanned teaching, there were few examples observed of teachers introducing unplanned materials using the IWB, and there were no examples observed of a teacher spontaneously creating a resource (e.g. a page of notes). The IWB was not used as a venue to building learning together in a constructivist manner, but rather as a site for displaying information, stimulus and instructions.

I also explored when IWBs were used in terms of the teaching sequence. Using stages developed from Gagne's instructional events as part of his Conditions of Learning Theory (1985), I looked for when IWBs were being used at the following stages:

- gaining attention
- identifying objectives
- recalling prior learning
- presenting stimulus
- guiding learning
- eliciting performance
- reviewing/plenary
- feedback/assessment

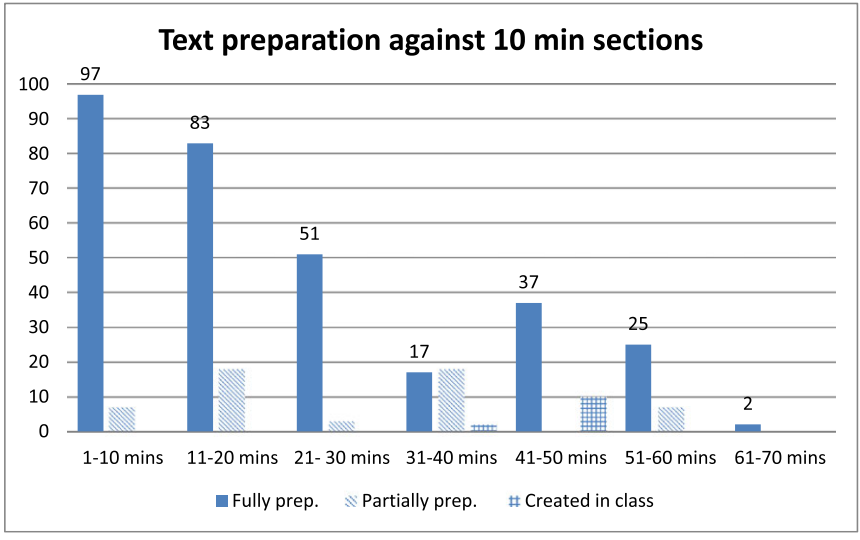
Eliciting performance featured predominantly in one lesson, and was the most 'counted' stage of instruction (34% of counts) but *guiding learning* figured most heavily across the lessons of a range of teachers (22% of counts),

followed by *presenting stimulus* (17% of counts). Examples of *guiding learning* include providing questions for learners to answer and giving them instructions on a task to be completed. The IWBs were least used for *recalling prior learning* (3% of counts), which may be a surprising outcome given the capacity for new technologies to save content from previous lessons.

Table 2 notes which stages of instruction were the main focus for each of the main resource creators (commercial publishers, teachers, pupils). Whilst the commercial publishers produced resources mainly focused on *presenting stimulus* and *gaining attention*, teacher-produced resources covered all stages but were heavily focused on *guiding learning*, emphasising, perhaps, a tendency to use the IWB as a class textbook.

In summary, this study presents a picture of the technology that is always switched on during an English lesson. IWBs are particularly heavily used during the first third of the lesson, but, even when they are not the main focus, they usually contain material which is pertinent to the lesson. Materials used on the IWB are usually completely prepared before the lesson, and there is little evidence of spontaneous use of the IWB during the lesson. In terms of when the teachers use them within their instructional phases, this is usually for guiding learning (e.g. giving instructions) and for presenting stimulus to learners. The memory capacity of the technology (e.g. for recalling work previously done) was rarely observed. The IWBs function very much as a whole-class text book, albeit one focused on the needs of an individual class.

Table 2: The number of counts for each stage of instruction for each of the resource creator types



The number of counts indicating the type text preparation noted in each 10 minute section of the lesson

Mainstay programmes

There were ten types of programme or application used within the observed lessons. These included games, name randomisers (programmes which randomly select names from a class list) and specialist English programmes (see Table 3). The two most commonly used programmes were PowerPoint and the specialist programme designed to be used with the IWB. Two brands of IWB were observed during the study: Promethean and Smartboard. Each make has a specialist programme that facilitates the interactivity of the board by pro-viding a range of operational tools and facilities. Smartboard designate this programme as an electronic notebook, and Promethean as an electronic flipchart. They are different programmes but exhibit similar functions such as making pens, highlighters and shapes available. In this study, they are termed electronic notebook and flipchart programmes (ENF).

ENF and PowerPoint emerged as key programmes and together account for nearly 82% of all the resource counts. They were the predominant resources observed. The single most counted programme was PowerPoint, although half of the counts made were for one lesson where Year 11 pupils were giving presentations and making extensive use of PowerPoint. When the counts from this lesson are removed, the number of counts of PowerPoint and ENF is very similar. The data from the study shows that, with the exception of the one aforementioned lesson, there was quite even use of the two programmes.

However, both programmes were not used by each individual teacher. With one exception, all of the teachers were observed to use either PowerPoint or ENF but not both programmes. Indeed, the teachers in the study used one pro-gramme predominantly, as a mainstay programme, which was used to the exclusion of the other key programme. When interviewed, six of the seven teachers expressed a deliberate selection of one programme. In the observations, three used PowerPoint and four used ENF. One of the teachers who used PowerPoint, Cherry, admits this choice related to a logistical rather than pedagogical decision:

> *I always use PowerPoint rather than using the board's own software. That's simply because I suppose it's ease of work at home –you know I've got PowerPoint on my laptop whereas I don't have the software that's needed to be able to put together the flipcharts and I prefer to do a lot of my work at home rather than constructing things at work.*

She also recognises her limitations and that other subject areas made use of different programmes:

> *It's what I'm used to – it's what I know. Whereas I do like the interactive whiteboards and I do use them but I wouldn't feel comfortable putting a scheme or work together purely based on flipcharts. It doesn't seem to fit. I know maths do – maths use them a hell of a lot – the flipcharts – and save the flipcharts and use them in the same way that we save PowerPoints.*

Table 3: The different types of resource observed on the IWBs (the number of counts made)

Resource creator	The no. of counts for each stage of instruction by different resource creators (Percentage for each resource creator in brackets)								Total
	Gaining attention	Identifying objectives	Recalling prior learning	Presenting stimulus	Guiding learning	Eliciting performance	Reviewing/ plenary	Other	
Commercial producer	12 (21.1%)	0 (0%)	4 (8.7%)	16 (34.8%)	4 (8.7%)	0 (0%)	3 (6.5%)	7 (15.2%)	46 (100%)
Teacher	3 (3%)	13 (13%)	2 2%)	19 (19%)	37 (37%)	11 (11%)	15 (15%)	0 (0%)	100 (100%)
Pupil	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	57 (100%)	0 (0%)	0 (0%)	57 (100%)
Total	**15**	**13**	**6**	**35**	**41**	**68**	**18**	**7**	**203**

The number of counts for each stage of instruction for each of the resource creator types

However, another teacher, Bill, said that he used both programmes, although he suggests that PowerPoint is overused when he describes another programme as providing 'something that's different to a PowerPoint'.

The adoption of one of two mainstay programmes suggests that the teachers see these as having some equivalence, or at least similarity, with the programmes performing the same sort of function on the IWB. Other evidence from the study, apart from the teacher interviews, would appear to reinforce this assumption. The study considered the main function played by the IWBs in the observed lessons. Four main functions were considered:

- display/broadcast of material
- manipulation of materials
- writing and/or annotation
- file/resource management.

The main function observed throughout the study was *display/broadcast,* gaining 78% of counts made. This was followed by *writing/annotation* (16% of counts) and *manipulation of materials* (7%). In all the schools, *display/broadcast* was the main function observed. The IWB was used as a presentational tool, rather than a venue for place for writing texts, for annotating text or for the manipulation or processing of texts and materials. Despite the fact that the IWBs use touch-sensitive technology and they have writing implements and features, the IWBs were usually used to display or broadcast material.

This tendency to use the IWBs for display is accompanied by a propensity to use prepared texts on the IWB. Indeed, 83% of the texts used on the IWBs were fully prepared texts used in the lesson, compared with 14% partially prepared and 3% created in the lesson. Moreover, most of these texts were created by the teachers themselves, rather than by a publisher. Generally, then, the texts used on the board were usually fully prepared text, indicating high levels of preparation in order to use the IWBs in lessons.

The use of the IWB for displaying/broadcasting mainly fully prepared texts was the case for those teachers observed using PowerPoint (3 teachers) and those using ENF (4 teachers). The perceived affordances of the IWBs used would appear to be very similar, then, in that materials are being prepared by the teacher (in most cases) and the IWB is being used to present this material to the class. The IWB is used as a presentational device, and either PowerPoint or ENF is usually the conduit or means for this presentation of material.

So does the preference of one main programme have implications for the affordances of IWBs for English teachers? There are key differences between these programmes, how they operate and what they afford on the IWB. PowerPoint provides for a set of slides which hold the content and generally progress automatically forward in a linear manner. ENF, on the other hand, offers a blank page or flipchart which allows for the inclusion of different types of content. Progression within ENF is not necessarily linear, and the user must determine the order of progression through the material. A further significant difference is the emphasis on pens/writing/highlighting in the ENF programmes. Writing and annotation are possible in both PowerPoint and ENF, but are a more significant part of the ENF programmes. PowerPoint does not emphasise handwriting notes or annotations. Within the study, two-thirds of the observed annotations occurred when ENF was being used. When teachers are exclusive in their practice – for example, not using ENF – they are potentially reducing the multimedia capability of their output. A limited repertoire of resources is likely to diminish the affordances of the IWB.

Such limitation in practice highlights the need for teachers to appreciate the complex interaction between pedagogy, content and technology. Koehler and Mishra describe this integrated understanding as technological pedagogical content knowledge (TPACK), the development of which 'is critical to effective teaching with technology' (2009, p.60). TPACK asserts that teachers need to understand:

- the technology (e.g. how to operate an IWB)
- the relationship between the technology and the content (e.g. combining multimedia elements on an IWB)
- the influence of the technology on the pedagogical content (e.g. the use of the IWB to analyse a text as a whole class)
- how to utilise and manipulate and all of these elements with understanding, insight and flexibility.

Understanding the pedagogic capabilities and potential of classroom technologies is essential if teachers are to make effective use of such technologies. There were clear examples of such fluent and effective practice in the study. One example was the teacher known in the study as Alice. Alice designed a starter for a Year 7 lesson on the topic of 'identity', with the aim of helping students to develop an understanding of the multifaceted concept of identity. The starter consisted of a number of statements relating to identity (e.g. 'your identity is what other people think of you') which had to be dragged to either a 'true' or a 'false' box. The students came to the board, one at a time, and moved a statement to the true or the false box. The statement remained visible only if it was dragged to the correct box. In this way, the students were able to self-correct, and Alice took the opportunity to help the class explore why the answer was true or false.

Alice used the ENF programme to create this task, employing a 'layering' effect so that the statements seemingly disappeared when dragged to the wrong part of the board. She was aware of this function of the technology and married this appropriately with the content. Her pedagogical approach was to allow the students to self-correct with the help of others in the class. Not only did this allow her to assess the students' awareness of the concepts involved in the lesson, but it also enabled her to lead a discussion of why answers were right or wrong. It was a low-attaining class, and Alice was looking for ways to boost their confidence and help them feel a sense of achievement: she explained, 'Because they've self-corrected they feel a sense of achievement.' It was a whole class activity, with individual students manipulating the IWB and enabling the class to move forward together, with a shared understanding of some complex ideas.

Alice considered how to blend the technology, the content and the pedagogy necessary for this teaching episode, and demonstrated that effective TPACK informed the learning in the lesson. In relation to the technology, Alice was helped by a good knowledge of the programme and how it operated. This type of in-depth knowledge of the technology is needed by teachers. Alice learned it from another teacher and then developed her own approach to using it.

A striking finding within the study was the lack of formal training on using the IWBs and the programmes that are available for use on the boards. All the teachers in the study showed immense enthusiasm and commitment to using the technology, but had received minimal initial training and then virtually no subsequent or ongoing training in the use of the IWB. They were all aware of the need for (and lack of) training and development. They mostly learned from their peers, often, as one teacher articulated, by 'wandering into other people's classrooms for a natter'. They recognised both individual and department needs, as the teacher known as Abigail admitted: 'I think we're not making the most of it. . . I still feel there's a lot more I can do with it.' Another teacher, Deborah, compared the initial training received for English with that for other subjects: 'They've got all the whizz bang things – where's all my whizz bang things?' Her rather deflated conclusion as an English teacher was that she could 'write words'. Deborah revealed that most training came from having 'a natter' with colleagues.

The affordances of these mainstay programmes are different and need to be better understood. A significant difference, for example, is how they support the creation of written text. PowerPoint has a series of readymade templates that promote particular structures or formats for the slides. Such preset structures may be helpful for creating an easily navigated house style for the benefit of learners, or to provide a structure to learners themselves when creating a presentation. The usual format of ENF is to offer a blank page accompanied

by a range of tools. This format may be more useful when creating a partially prepared activity for learners to complete.

Adopting one mainstay programme is an understandable consequence of providing teachers with complex technological resources without ongoing training and time to develop their understanding of the affordances of the technology. However, understanding what each of these mainstay programmes offers is important if the technology is to contribute to effective teaching and if teachers' approaches are to develop.

Handwriting

The English teachers observed in the study made much use of written text on IWBs. It was the most common element of content used on the IWBs during the observed lessons. Written text (often accompanied by other types of content such as pictures) accounted for 86% of the observed content. IWBs support both handwritten and printed text. Intriguingly, the analysis of the IWB revealed that 5% of the written text used was handwritten set against 95% being printed (Table 4). This indicates a strong preference for printed text being used on IWBs, and indeed three of the teachers observed used no handwritten text on the IWB, apart from brief annotations.

Where handwriting was employed, it was as part of ENF use. Apart from some annotation, there were no examples of handwritten texts being used as part of PowerPoint presentations, as these are designed for printed text. One possible implication of this tendency for printed text is that flexibility of practice is reduced, as handwritten text may be more likely to be used in situations requiring a spontaneous response - to learners' questions, for example. Teachers who do not use ENF programmes and who use only printed text may be ignoring the affordances offered by using handwritten text.

IWBs offer writing tools and options, but these were not widely used by the teachers in the study. The lack of handwritten texts is a clear departure from

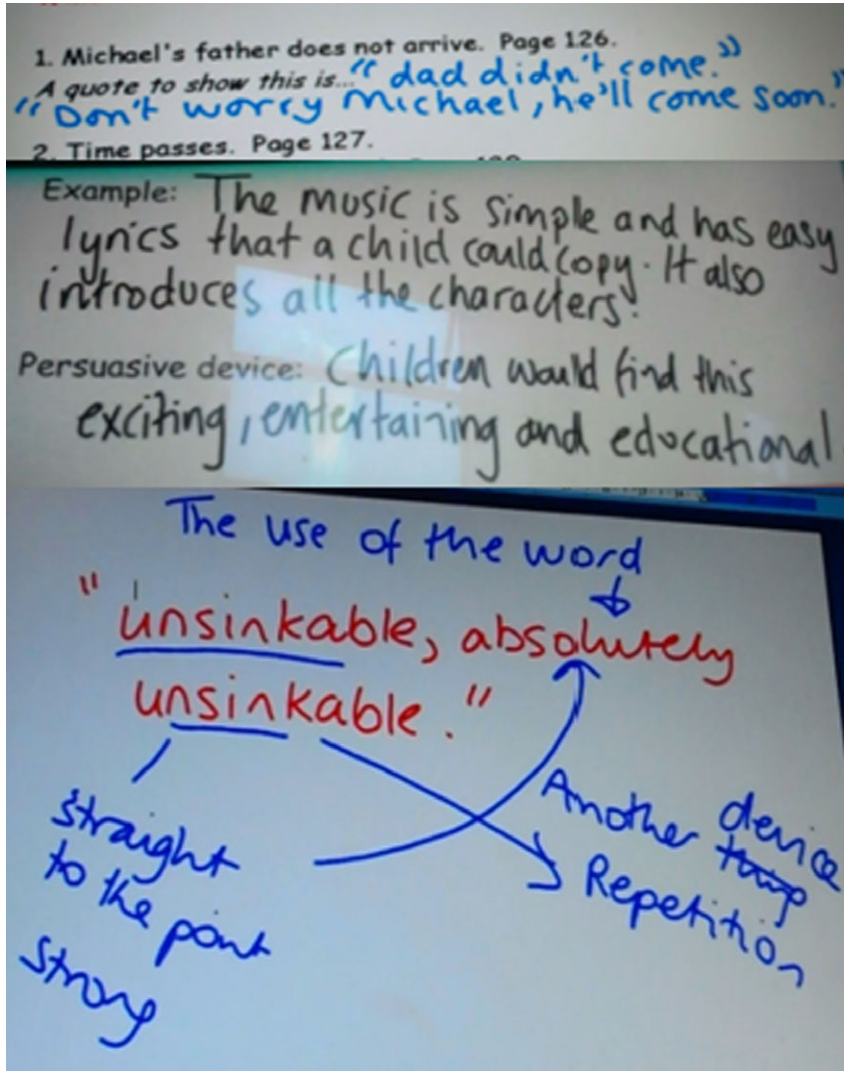
Table 4: The counts of printed and handwritten text for each teacher

	Written text	
Teacher	Printed	Handwritten
Abigail	36	3
Alice	13	0
Beverley	12	1
Bill	20	0
Bryn	69	0
Cherry	27	1
Deborah	7	4
TOTAL	**184**	**9**

traditional blackboards and whiteboards, and may come from a desire to present text clearly and professionally. However, there may be a more fundamental issue. Figure 2 shows examples of three teachers' writing. While the text is clear, the pen lines are rather thick, which appears to make the writing more bulky and less fluent.

Two of the teachers comment on the difficulty of writing neatly on the IWB. Beverley mentions that the IWB 'does make a mess of your handwriting' and alludes to the need to orient or reconfigure the board so that the pen point

Figure 2: : Examples of handwriting on an IWB from three teachers



is aligned to the writing point on the board. Deborah recognises that handwriting is a skill to be practised: 'the more you practise with the board, the better your handwriting is – and it is a case of calming yourself down and not scribbling across it.' It seems that in a language subject, which focuses heavily on written text, the tools and options for handwriting need to be efficient or they will be ignored. The evidence from this study shows that English teachers are generally not using this affordance of the IWB, and the implication is that IWB manufacturers may need to consider how to make handwriting more fluent and acceptable for a text-heavy subject such as English.

Conclusions

This article emanates from a study which sets out to establish what might be considered normal or commonplace within the practice of a small group of English teachers who routinely use IWBs in their classrooms. Using the notion of affordances, it considers the relationship between English teachers in the study and their IWBs.

To the teachers in the study, this technology has become a routine and significant part of their classroom practice, whether it is used as the main focus of the teaching or as a supportive 'background' resource. The teachers use IWBs particularly in the first part of a lesson, when heavily prepared resources provide stimulus, instruction and guidance. The IWBs almost take the role of a whole-class text book, which is designed for one particular class.

In preparing these resources, the teachers usually draw on one core or mainstay programme. This is either PowerPoint or the specialist programme that accompanies the board (ENF). The teachers recognise the presentational functions of these core programmes, and the resources which are created are usually for the purposes of display/broadcast as opposed to creative or explorative activities. The teachers may not recognise that the different programmes have different functions which potentially serve different purposes.

The study highlights the primacy of written text on IWBs for English teachers, and how such written text is usually typed text, rather than handwritten. Indeed, the keyboard dominates the pen, as the handwriting function was rarely used on the IWB within the observed lessons. The important affordance of handwriting was ignored by the case study teachers, apparently due to the awkwardness of the handwriting process and the end results.

The successful integration of IWBs into the classroom requires an 'education-led' solution (Mercer 2010, p.xv) and a focus on design-based research where technological innovation is relevant to classroom practice (Reimann 2006). There is a need for technological pedagogical content knowledge (TPACK) on

the part of the teacher (Koehler and Mishra 2009). A complex interaction between technology, pedagogy and content must be must be handled by teachers in their role as 'curriculum designers' (Koehler and Mishra 2008, p.3). There was a striking lack of training and time for reflection and development experienced by this group of teachers. They all considered themselves self-taught and none had had recent training. This research highlights, therefore, the need for English teachers to have:

- continuing professional development that explores the affordances of IWBs, and how to be curriculum designers
- formal time with peers to reflect upon, share and develop good practice.

This would go a significant way to providing the 'ambient light' (Gibson 1986, p.140) needed to see the potential of this ubiquitous technology; and to supplementing the teachers' own impressive commitment to the subject and the technology.

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