‘The visual helps me understand the complicated things’: pupil views of teaching and learning with interactive whiteboards

Kate Wall, Steve Higgins and Heather Smith

Kate Wall is a research associate in the Centre for Learning and Teaching at Newcastle University. She has a particular interest in gathering pupils’ views of learning and their thinking about learning in different contexts, in particular, how ICT can facilitate pupil reflection and how metacognitive talk can be initiated. Address for correspondence: Kate Wall, Centre for Learning and Teaching, Newcastle University, Joseph Cowen House, St Thomas Street, Newcastle upon Tyne, NE1 7RU. Telephone: 0191 222 6943; email: Kate.Wall@ncl.ac.uk. Steve Higgins is a senior lecturer and is Director of the Centre for Learning and Teaching at Newcastle University. His research interests are in the area of developing children’s thinking, ICT, and mathematics in primary education. Heather Smith is a lecturer in primary education affiliated to the Centre for Learning and Teaching at Newcastle University. Her interests are related to the use of games for learning with pupils who have English as an additional language.

Abstract
This study is one element of a government-sponsored evaluation into the introduction of interactive whiteboards (IWBs) to Years 5 and 6 in English primary schools. This element of the research aimed to gather information regarding pupil views of IWBs and the impact these tools can have on teaching and learning. To extend current literature, the method targeted pupils’ views of how IWBs can impact on metacognition: thinking about learning. Using a template that has been developed by the Centre for Learning and Teaching at Newcastle University, pupils were encouraged to talk about learning in different contexts; this methodology and its rationale are described. The results show that overall comments from the pupils are positive, with the resulting themes encompassing how the IWB can facilitate and initiate learning and impact on preferred approaches to learning. The pupils describe how different elements of software and hardware can motivate, aid concentration, and keep their attention. On the negative side, pupils candidly describe their frustration when there are technical difficulties, their desire to use the board themselves and their perceptions of teacher and pupil effects. As IWBs are becoming more and more prevalent in schools, we discuss implications and make recommendations for teachers and manufacturers.

Introduction
This article reports on pupil views of Interactive Whiteboards (IWBs). The pupil views templates are one research method used in a government-sponsored project evaluating
the introduction of IWBs into Years 5 and 6 in selected primary schools. The purpose of this project was to evaluate the implementation of the boards in six Local Education Authorities (LEAs) dispersed throughout England, with 12 schools in each LEA participating in the project. Boards produced by three of the main IWB manufacturers were included in the sample.

An extensive critical literature review, including all empirically based studies, has been completed and provides a sound theoretical basis for the research; this is published elsewhere (Smith, Higgins, Wall & Miller, 2005). The main research study used a multimethod approach that included real-time computerised coding of observational data, video analysis, teacher and pupil interviews, and an online pupil attitude questionnaire; these methods are fully reported in the main report (Higgins et al., 2005). The method reported in this paper aimed to gather information on the pupils’ perspective of IWB use and the resulting teaching and learning process. Information was also sought regarding pupils’ views on learning and the impact of IWBs on metacognition.

Background: researching pupil views
In 1989, Article 12 of the United Nations Convention on the Rights of the Child increased the emphasis on the entitlement of children to have their voice heard. It states that: ‘children and young people have a right to be involved in the decisions that affect them. This right extends from decisions affecting them as individuals, to decisions that affect them as a collectivity’. Since then there has been increased educational research investigating and consulting pupils about different aspects of schooling. For example, pupils have been asked about their experiences of curriculum, assessment, and pedagogy (Pollard, 1996) and Tunstall and Gipps (1996) researched pupils’ views of formative assessment. Pupils’ attitudes to school and the work they are given were looked at by Blatchford (1996) and Flutter and Ruddock (2004) explored the role pupils as researchers could have in school improvement.

Few studies have explicitly looked at learning and the associated metacognitive processes. One study that has tackled this issue is that of McCallum, Hargreaves, and Gipps (2000). A mediated interview was used with children as young as 7 years old to explore ‘learner conditions and classroom conditions that they [pupils] believed were conducive to learning’ (p. 279). However, even this study does not go as far as to examine pupils’ thinking about learning within different contexts: the metacognitive process. This trend continues within IWB research: pupils have been asked for their views (Glover & Miller, 2001; Goodison, 2002; Levy, 2002), but we have found no research that has explicitly asked about learning, metacognition, and the role an IWB has to play in this process.

This is the purpose of this study. The data triangulate with interview data from teachers and more traditional interview data collected from pupils, shown in the main report (Higgins et al., 2005).
A method for speaking to children about metacognitive processes
This methodology has origins in Bubble Dialogue (see http://www.dialogbox.org.uk/BubbleDialogue.htm) based on work by McMahon and O’Neill (1992) using speech bubbles to support discussion and role play in citizenship and values education. The research of Hanke (2000) and Higgins, Miller, Wall, and Packard (2004) has also shaped the research process; both of which looked at gathering pupil views across the primary age phase and the latter explicitly looking at the pupils’ perspective of how ICT can be used to aid learning.

A template was designed to stimulate talk about learning to be a mediational tool in an interview. The image on the template is recognised by children as the learning context under scrutiny (Figure 1) and discussion is initiated by this. The design of the image means that the pupil can interact with it: adding faces to the teacher and pupils and drawing representations of their favourite lesson on the IWB. This method of mediation is useful in overcoming any interviewer-interviewee tensions, a variance that can be particularly pertinent between adult and child (Greig and Taylor, 1999).

This template forms the basis of a mediated interview on the issues. By providing an image of the learning environment under examination, the process becomes a three-
way interaction between the researcher, the pupils, and the template, stimulating talk about the learning context (Figure 2).

Most research has been restricted to pupils’ attitudes and beliefs about teaching, curriculum content, and school/classroom structures (the process of teaching). This method aimed to gather this information and to also go beyond it into metacognition (the process of learning). This was done through the use of the speech and thought bubbles on the template.

The thought bubble provides information about the conscious ‘internal’ mental processes: what they perceive ‘is going on inside their head’ (metacognition). In contrast, the speech bubble looks at factors external to the individual: the learning of other pupils, teachers, and parents and practicalities of learning in the specified context (cognition in general). An overlap between the two fields of data is expected with regard to advantages and disadvantages of IWBs and subject differences in their use. A diagram of the rationale is shown in Figure 3. The mediated interview began with the completion of the more general speech bubble and then moved on to the metacognitive processes (the thought bubble). This meant that the pupils’ thoughts could progress steadily towards the more complicated discourse about learning and thinking.

The templates were designed so that they could be administered by one of three different researchers in the field using a structured set of prompts (Table 1) to increase reliability across the interviews.

The templates were used with groups of four to six children, much like a focus group (Greig and Taylor 1999). Issues arising from the stimulus were discussed and the pupils were encouraged to write down their thoughts and ideas in the appropriate bubble on individual templates. It was emphasised, however, that they did not need to comply with any conventions (e.g. spelling or grammar) and could complete the template in their
own way: for example, some children added their own bubbles for extra space and a few used drawings to illustrate their meaning.

The context of the interviews differed depending on the school but were usually completed in a room away from the main classroom during general teaching sessions. The
pupils were all Year 6 (10 or 11 years old) and had been using the IWB for at least a year. The main project (Higgins et al., 2005) investigated teachers’ use of IWBs across schools and therefore the kind of usage that the pupils were experiencing; it is enough to say that practice varied between teachers depending on ICT confidence, level of training, and software availability.

The data collected from the mediated interviews have the advantage that data are recorded on paper, without the need for transcription. This means, however, that data collected are only those that are written by the pupils: topics or issues covered as part of the discussion might not end up on the templates. On the other hand, the written element tends to make responses more succinct and to the point and allows direct participation of the pupils. The form in which the data are produced (short one-word answers, phrases, and sentences) allows for qualitative and quantitative analysis, a considerable advantage. Analysis was completed using NUD*IST (software for qualitative data analysis) and SPSS (a statistics software package for social science researchers). Quotes included are representative of the categories used for coding.

Results: the pupils’ perspective
Eighty pupils (46 boys and 34 girls) in three LEAs completed the pupil views templates. The responses were broken down into 1568 individual statements for analysis, ranging from single words to whole sentences. The split between responses in the thought and speech bubbles was approximately equal (51% and 49% respectively).

The statements were categorised according to whether they were positive, negative, or neutral (Figure 4). This classification forms the structure for the presentation of results.

![Figure 4: Categorisation of statements into positive, negative, and neutral](image-url)
**Positive comments**

A number of key themes were found within the positive statements shown in Figure 5. These tendencies will be analysed in turn.

**Facilitation of learning**

A predominant tendency was the role pupils perceived that the IWB had in facilitating their learning. Within this category a number of themes were apparent (Figure 6).
Pupils frequently mentioned how the IWB assisted their understanding ($n = 40$) and the impact this had on their metacognition (70% of these comments appeared in the thought bubbles). For instance, this understanding was commonly linked to:

- **The use of different software**

  The teacher has several of the same programmes and shows different ways of working it out so we can see other methods and I can see how I worked it out because sometimes... we don’t know how we did it and to see easier methods... (boy, age 11)

- **The visual display of information**

  The more she says what we need to do, I understand it more, but it’s better to have visual effects (girl, age 11).

- **The use of games**

  This use of games was indicated as having an important influence in supporting and maintaining the learning process. Pupils talked about how games made learning fun, easier, and changed their conception of specific subjects (particularly mathematics). For example:

  I like maths on the interactive whiteboard because I like the games and it is easy to understand (boy, age 10).

Many of the pupils also talked about how the IWB affected their thinking ($n = 36$). A common aspect within this category was the impact on children’s ‘imagination’ ($n = 9$), either in supporting their own thoughts or by giving real, concrete examples to illustrate discussion:

I like the way you can see things moving rather than imagining they are (boy, age 10).

Some of the other comments categorised under the thinking process linked closely with ‘assists remembering’; the IWB was seen as helping memory and the thinking around ideas. Three comments linked this retention directly to the structure of the software (in this case Smart Notebook), with one pupil stating that she could:

Flick pages back in your mind (girl, age 10).

Pupils believed that concentration was aided by the use of an IWB. The way in which information was presented, either by the teacher or by the pupils, was also commonly mentioned:

You learn better with a smartboard because you can demonstrate things and not just tell them (girl, age 10).

The final interesting aspect of how the IWB facilitated learning was the perceived value of pupils using the board themselves. Many of the pupils expressed the opinion that the
The desire to use the IWB was motivating, although it is suggested later in this paper that they feel this is not a strategy that is used enough.

The interactive whiteboard improves people’s behaviour because they want to go up and write on it (boy, age 10).

Initiation of learning

Many positive statements were made regarding the way pupils felt the IWB initiated learning. A number of common themes were found; the most frequent were, in ascending order, ‘motivational’, ‘fun’, ‘attention’, ‘interest’, ‘confidence’, and ‘prepared to learn’ (Figure 7).

Motivation was indicated as a key factor impacting upon the pupils’ metacognitive process (89% of comments were written in the thought rather than the speech bubble). Within this category, pupils mentioned motivation from a desire to actually use the board themselves.

The desire to have their work shown on the IWB itself was also seen as motivating (although not every child agreed with this):

I would feel happy having my work shown on the interactive whiteboard because people can give you some good views on your story (girl, age 10).

In contrast, ‘fun’ was a characteristic more generally attributed to IWB use (with 60% of comments placed in the external speech bubble). In addition, many children thought that the perceived fun aspect of the IWB was an important influence in instigating their own learning:
The board helps me to learn because it is really fun and at the same time we learn (boy, age 11).

Preferred approaches to learning
Another common positive theme regarding metacognitive process were comments relating to different approaches to learning. This tendency illustrated how the children felt the IWB supported their thinking and learning. The subcategories within this section are shown in Figure 8. The majority of comments made by pupils were in the thought bubbles and appear to be evidence of pupils thinking about their own learning.

The pupils most commonly associated the IWB with visual ways of learning. The majority commented on how the visual and verbal elements complemented each other and promoted effective learning:

The pictures help you to understand what the teacher is talking about (girl, age 10).

However, as shown in Figure 8, the verbal-social aspect of learning with the IWB was also valued. Two common tendencies emerged: the perceived value of sharing thoughts and the increased motivation to contribute ideas. Seventeen pupils mentioned how the IWB made them want to volunteer information more in class. Fifty-seven per cent of comments in this section talked about the value of learning together, sharing, and the positive impact of social learning.

You must get a smartboard because it helps you mix your ideas and work together (girl, age 10).
Only two children talked about approaches relating to tactile and kinaesthetic
approaches, relating to moving objects around the board:

It helps because you can see things, hear things and move things around the board (boy, age 10).

Software, hardware, and multimedia capabilities
Many of the comments related to the hardware, the software, and the multimedia
characteristics associated with the IWB. With regard to the hardware, the board itself
was mentioned 50 times; these comments all related to improved visibility. Different
aspects of the hardware mentioned were the link with video, DVD, scanner, and printer.
The fact that work could be saved from the board was mentioned by a number of pupils
as an advantage ($n = 14$):

Keeps in my mind because in colour and you can save things and go back (boy, age 11).

With regard to software, the facility to use different programmes to explain things and
the structure of programmes were valued (both previously mentioned relating to facil-
itating learning). A further interesting software aspect was the perceived value of access
to the internet ($n = 23$):

Smartboards help you to learn by, you can just suddenly go into the Internet and find out
information (girl, age 11).

Many pupils mentioned different multimedia functions of the boards. Twelve per cent
of positive statements mentioned this function, with particular reference to the use of
colour and movement:

It helps us to learn because movement, sound, rotation, quick, internet—pictures microscope,
enlargement (girl, age 11).

Subject-specific advantages
Many of the comments made by the pupils were subject-specific (Figure 9). Positive
comments were most commonly made about mathematics ($n = 84$). Pupils commented
particularly on the ‘shape, space and measure’ aspect of the National Numeracy
Strategy; with particular reference to increased accuracy ($n = 7$). Some pupils stated
that the IWB had changed their opinion about mathematics:

I like the whiteboard because it changed my mind about hating maths (boy, age 11).

Many of the comments linked IWB use and mathematics with ‘fun’ and ‘games’:

Maths has more programmes, movement, colour, sounds, feelings whilst writing, fun (girl, age
11).
The second most commonly mentioned subject was ICT: many pupils thought that a major advantage of using the IWB was that ICT skills could be learnt through other subjects:

It is easy to see and, because it is worked by a computer, it is like having an ICT lesson all the time (boy, age 10).

Literacy was not referred to as frequently as might be expected. Positive comments centred on the way in which the board could be used to demonstrate drafting and redrafting:

It makes lessons better like English because it has a highlighter, rubber etc. (boy, age 11).

Pupils commented on how the IWB could be used positively in science. Pupils mentioned the element of ‘realism’ and the demonstration capacity that the board brought:

Science: it’s easy to understand because you can see something happening rather than someone telling you (boy, age 10).

Benefits for teacher and pupils

The final area of positive comments we will discuss is the area of benefits seen by the pupils for other people, both teachers and pupils. The pupils felt that it helped their teacher explain concepts:

I think it helps the teacher teach (girl, age 10).
Pupils also talked about the motivational impact of the board on their teachers, making them more enthusiastic and innovative:

The teacher is more inventive and more active (girl, age 10).

With regard to benefits for other pupils, the most common response was the perceived advantages for children with special educational needs \((n = 42)\) and for pupils with behavioural problems \((n = 33)\):

I think the interactive whiteboard helps children who behave badly and children who are not smart (boy, age 11).

**Negative comments**
There were a total of 191 statements made by the pupils categorised as negative (12% of the total). A number of tendencies emerged from these comments, summarised in Figure 10.

**Technical difficulties**
Most negative comments surrounded issues with technical reliability of the boards and the associated equipment, and analysis led to the identification of a number of sub-themes (Figure 11). Complaints were commonly grouped under the generic term: ‘it breaks down’. Pupils from every school mentioned the fact that their board broke down.

Many children talked about the need for recalibration in the middle of the lesson and the impact that this had on teaching and learning:
The bad things about Smartboards are when you can’t read the writing and you have to orientate the board and it wobbles some times (girl, age 11).

Waiting for the technology was also a common complaint, particularly with regard to starting up and shutting down the board.

Many pupils considered the board and projector very fragile. It is not possible to know whether these sentiments originated with the teacher or pupils, but there was a close relationship between these comments and that of expense; pupils were very aware of how much the IWB cost:

It is not very good for younger children because they might fiddle and they don’t know how much it costs (boy, age 10).

The expense issue was also linked by some pupils to the fact that they felt learning could be facilitated sufficiently well without the use of an IWB:

I don’t think the interactive whiteboard helps, but I think the books and the teacher helps me (boy, age 11).

Pupil participation
The second most common area of negative attitudes was with regard to pupil participation and use of the board. This links closely to positive comments made about the motivation and learning that pupils’ involvement was felt to facilitate. Many pupils mentioned that they would like to have a go, but that there was insufficient opportunity for this and how it would benefit their learning:

I wish I could have a go because it would help me to do it (boy, age 11).
Some of the negative comments mentioned issues regarding software and hardware. Problems with the hardware were mainly related to perceived deficiencies in individual school’s ICT provision, for example, no speakers linked to the IWB, no scanners, and the size of the board itself. Common software concerns included the impact of the same programme being used repeatedly and subject-specific insufficiencies:

I wish someone would put something more exciting on the computer for English because some lessons get very boring (girl, age 11).

Teacher effects
Some pupils perceived that the IWB had a negative impact on their teacher. This was quite a varied category with some pupils feeling that the IWB affected the pace of the lesson:

Sometimes teacher moves on to quickly (boy, age 11).

Others commented on their teacher’s (particularly supply teachers) lack of technical knowledge with regard to the board and the way that this influenced the lesson:

Sometimes the teacher forgets how to work the programmes (girl, age 11)

In fact on one of the completed templates a pupil added a thought bubble for the teacher saying ‘stupid board’.

Health fears
Finally, we draw attention to a negative issue some pupils expressed, fears about the boards’ impact on their health. Twelve pupils mentioned that there could be adverse effects, including headaches, sore eyes, and epileptic fits:

It can give you headaches if keep looking at it for a long time and can give you fits (boy, age 11).

Conclusions
Pupils’ understandings of their own learning are a relatively underexplored element in educational research and, as concern with metacognition and self-regulation as the foundations of effective lifelong learning becomes more prominent, it becomes increasingly important to get the pupils’ perspective. A great deal of time and money has been invested in IWBs, with concomitant promises for the benefits: we can only understand the impact if pupils’ views are added to the mix. The innovative method of pupil view templates has proved a rich source of data and has raised a number of different issues regarding the use of IWBs in the primary classroom and the potential impact pupils perceive on the teaching and learning process. The templates themselves have proved effective at structuring pupils’ thinking and successfully gathering data on metacognitive process.

We see little reason not to take many of the pupils’ views at face value; therefore there are some important implications. In addition to the process- and curriculum-focused
training they have already received, teachers might be advised on how IWBs can affect pupils’ understanding, remembering, and thinking. The indications are that IWBs can be effective tools for initiating and facilitating the learning process, especially where pupil participation and use of the board is utilised. An important finding is that there is a relationship between IWBs and pupils’ views of learning, with visual and verbal-social learning being particularly prominent. The way in which information is presented, through colour and movement in particular, is seen by the pupils to be motivating and reinforces concentration and attention. Pupils also perceived that IWBs can influence the teachers themselves, both positively and negatively, and were aware of the impact this can have on teaching and learning.

The hardware in the classroom was viewed by the majority as positive, with pupils being perceptive about its potential. Manufacturers need to be aware of the impact technical difficulties may have on teaching and learning processes within the classroom. With regard to the software, pupils believed that different packages aided effective learning by tackling problems from different perspectives, by supporting memory, and by supporting the teacher’s explanation. These aspects should be accentuated in future software and hardware developments. Software deficiencies in English lessons were commented on, with pupils more positive about using the IWB in mathematics and science. There are two aspects to this: pupils appear to have less experience of a variety of software in English and they perceive what they have experienced to be of a lower quality to the provision in other curriculum areas; and there needs to be some action to readdress this imbalance between the subjects.

The data reported in this article reveal that IWBs have been received positively by the majority of pupils for many different reasons. As IWBs are becoming more and more prevalent in primary schools, the apparent impact on pupils’ beliefs about learning and metacognition must be recognised and acted upon by both teachers and manufacturers.

References