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"The visual helps me understand the complicated things": Pupil views of teaching and learning with interactive whiteboards

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Abstract

This study is one element of a Government sponsored evaluation into the introduction of interactive whiteboards (IWB) to Years 5 and 6 of 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 IWB can impact on metacognition: thinking about learning. Using a template that has been developed by the team at Newcastle University children 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 affects. We discuss implications and make recommendations for the teacher and manufacturers.

Introduction

In 1989, Article 12 of the UN conventions 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 school. Few, however, have explicitly looked at learning and the associated metacognitive processes. For example, pupils have been asked about their experiences of curriculum, assessment and pedagogy (Pollard 1996), 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 (1994) explored the role pupils as researchers can have in school improvement.

Few studies have explicitly looked at the learning process. One study which has tackled this issue is that of McCallum *et al* (2000). A mediated interview was used with children as young as 7 years old to describe "learner conditions and classroom conditions that they [pupils] believed were conducive to learning" (p.279). But, 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 interactive whiteboard research: pupils have been asked for their views (Levy 2002; Glover and Miller 2001; Goodison 2002), but no-one that we have found has explicitly asked about learning, metacognition and the role IWBs have to play in this process.

This is the purpose of this study and comprises research arising from a Government sponsored project evaluating the introduction of interactive whiteboards (IWB) into Years 5 and 6 in primary schools. Six Local Education Authorities (LEAs) dispersed throughout England, with 12 schools in each, participated in this project. The study used a multi-method approach with real-time computerised coding of observational data, video analysis, teacher and pupil interviews and a pupil online attitude questionnaire. 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. Within the main project this data triangulated with the interview data from teachers and the more formal interview data collected from the pupils.

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 (2001) and Higgins *et al* (2004) has also shaped the design 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 which can be particularly pertinent between adult and child (Greig and Taylor 1999).

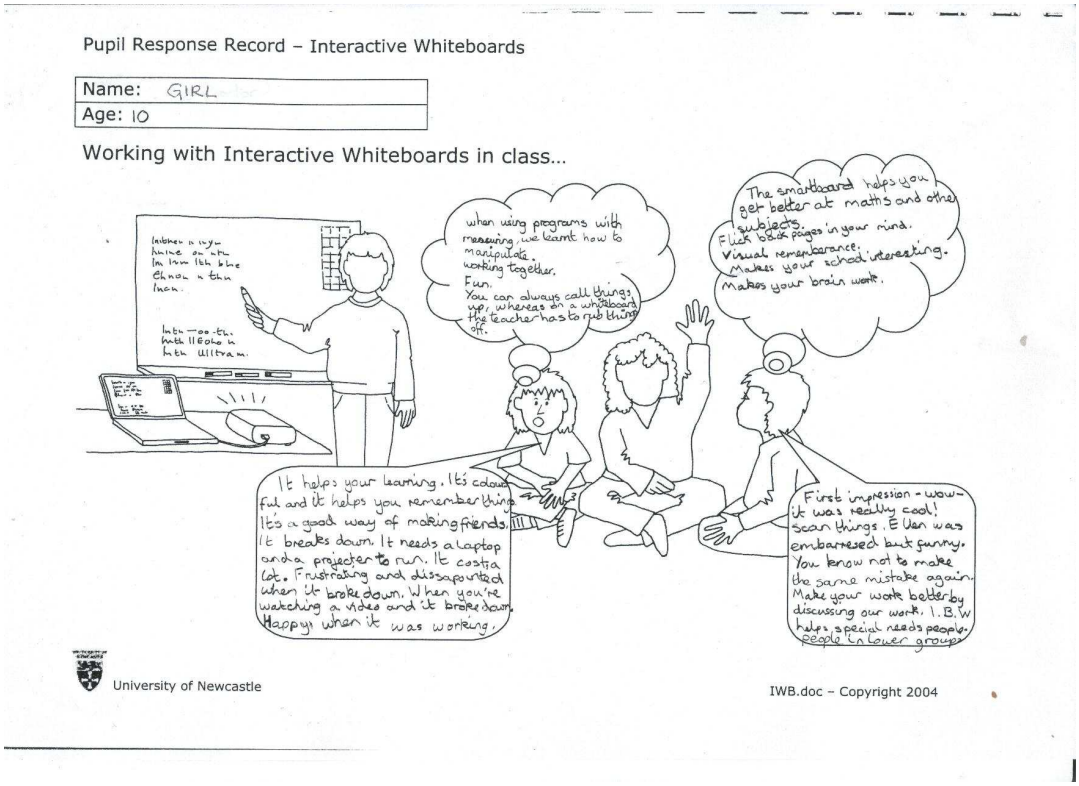

Figure 1: ***Example of template used to collect pupil views***

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).

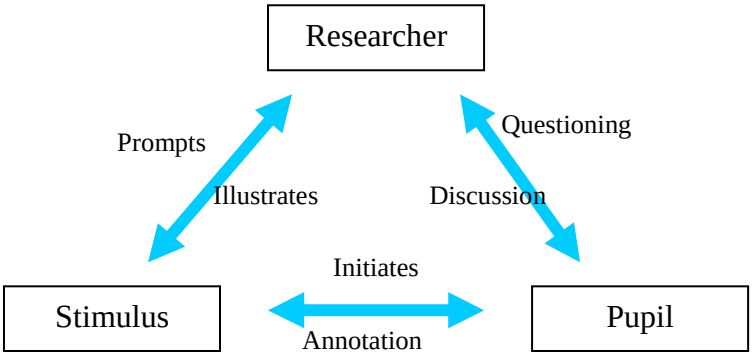

Figure 2: ***Model of interaction using the template***

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 but 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 was expected with

regard to advantages and disadvantages of IWBs and subject differences in its use. A diagram of the rationale is shown in figure 3 The mediated interview started 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.

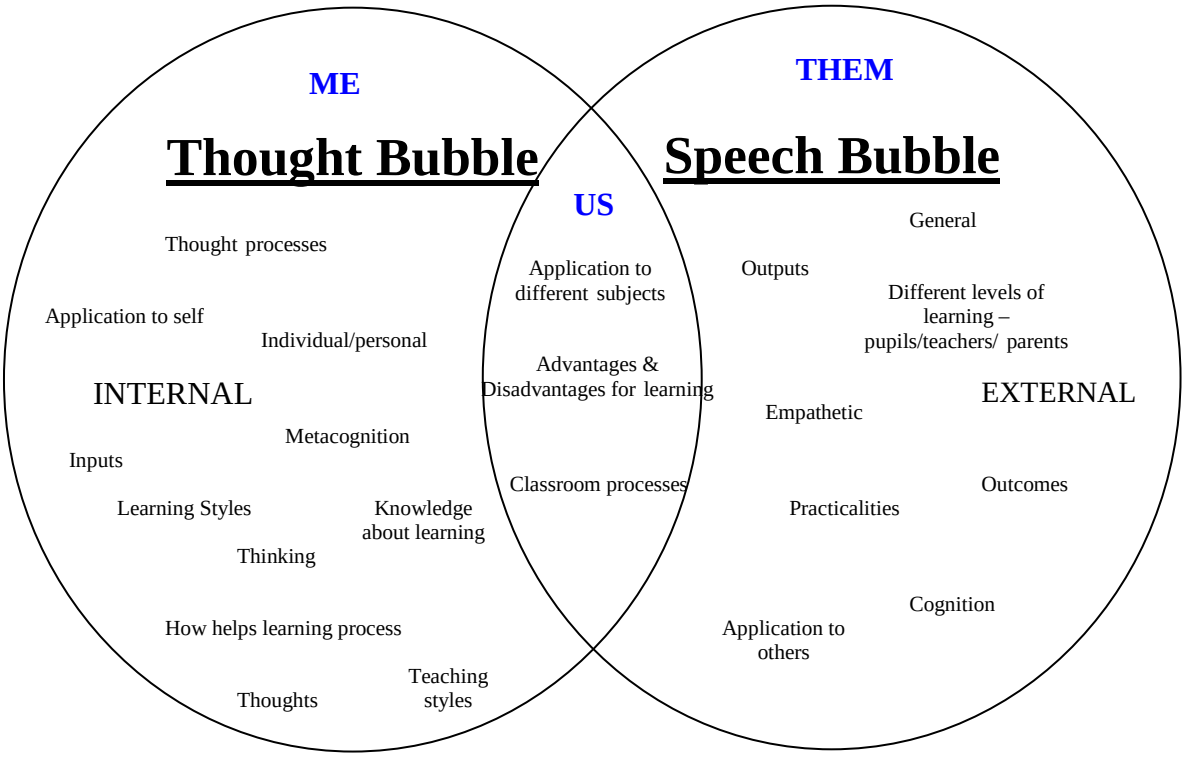

Figure 3: ***Venn diagram of thought and speech bubble rationale for pupil views template***

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 interviews.

Table 1: *Examples of prompt questions used by the researcher with the template*

Thought Bubble (Internal)	**Speech Bubble** (External)
• What did you learn when using the IWB? • What new skills did you achieve when using the IWB? • What did you learn about how you learn? • What about working with other people, did you learn anything new? • How did the IWB change the way you think about the subject? How? • How will IWB change how you do things in the future? • How did the IWB help you?	• Why would you tell another school/teacher/child to use the IWB? • What do other children/teachers/ parents learn with the IWB? • What was good about using the IWB? • What was not so good about using the IWB? • Who would you want to show this work on the IWB to? Why? • Has any of your own work been put on the IWB? How did this make you feel? • Who do you think would benefit most from learning using the IWB?

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, they did not need to comply with any conventions (for example 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 data collected from the mediated interviews has the advantage of on paper, without needing transcription. This does mean, however, that data collected is only that which is written by the pupils: topics 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. The form in which the data is produced, short one word answers, phrases and sentences, allows for qualitative and quantitative analysis, a considerable advantage. Analysis was done 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 3 LEAs completed the pupil views templates. The responses were broken down into 1568 individual statements for analysis; ranging from one word 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.

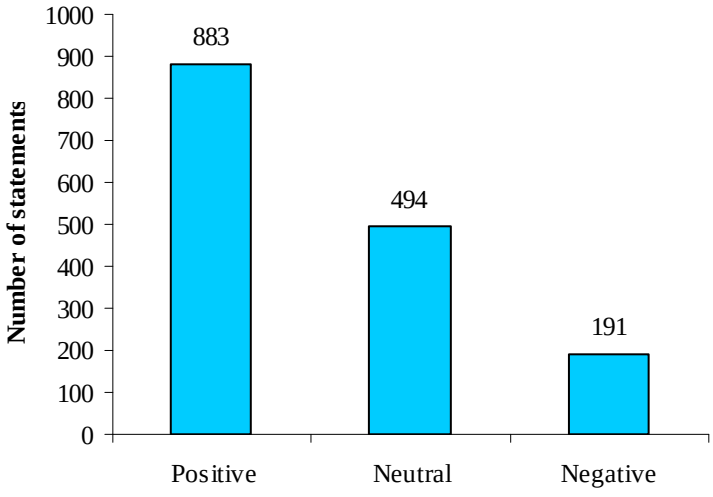

Figure 4: ***Categorisation of statements into positive, negative and neutral***

Positive comments

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

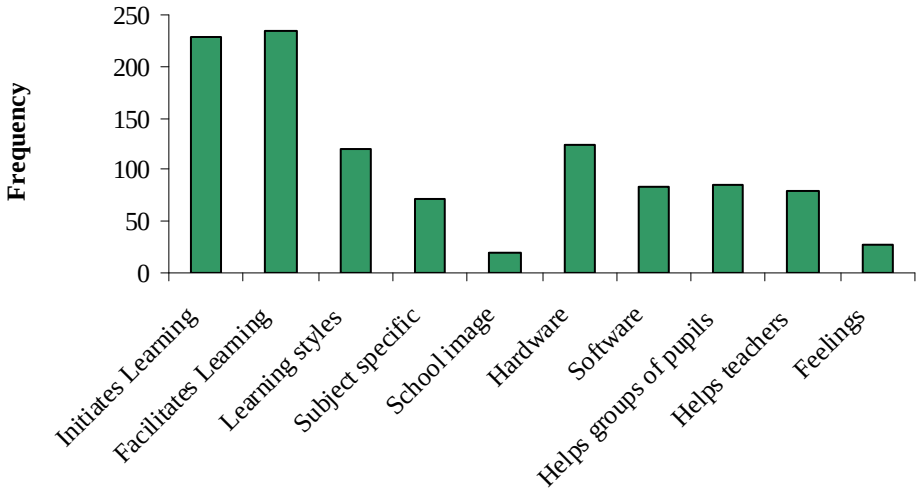

Figure 5: ***Key trends across positive statements***

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 that 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 programme 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 it isn't and we don't know how we did it and to see easier methods (Male, Age 11)

- The visual display of information

The more she says what we need to do I understand it more but its better to have visual effects (Female, Age 11)

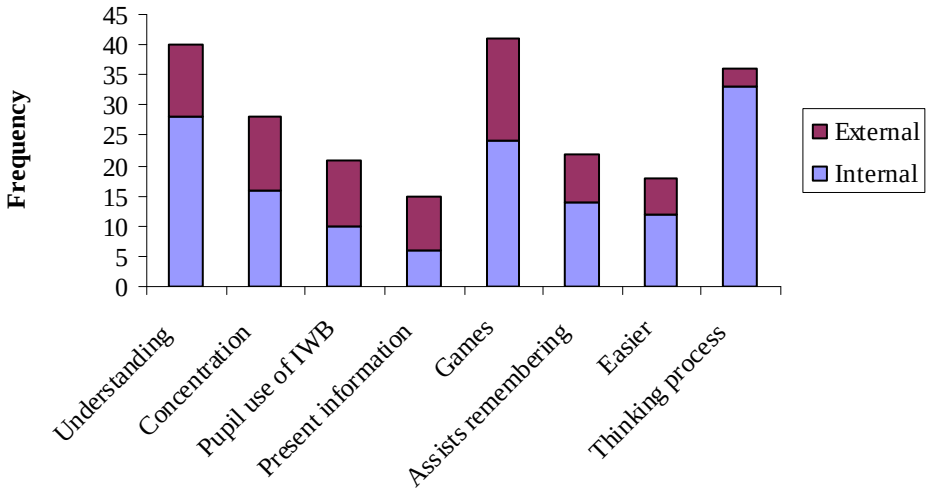

Figure 6: ***Sub-categories for 'facilitating learning'***

- 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 (Male, 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 (Male, 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), stating:

Flick pages back in your mind (Female, 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 pupils, was also commonly mentioned.

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

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

The interactive whiteboard improves people's behaviour because they want to go up and write on it (Male, 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 6).

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 use the board.

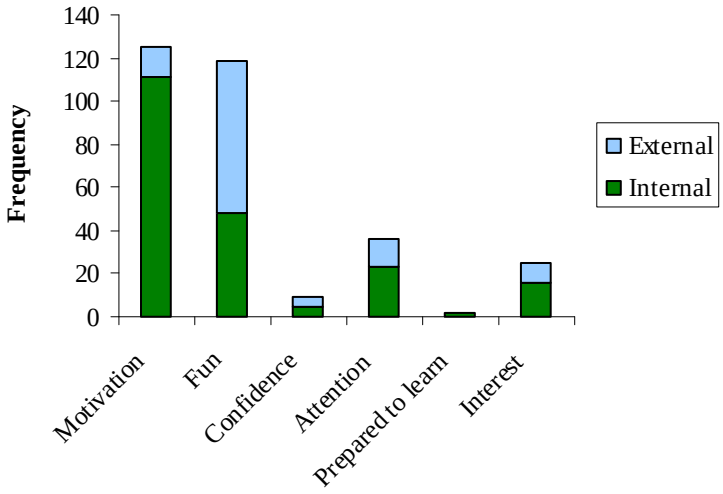

Figure 7: ***Sub-categories for 'initiated learning'***

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. (Female, 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 (Male, Age 11)

Preferred approaches to learning

Another common positive theme regarding metacognitive process were comments relating to different approaches to learning. This tendancy illustrated how the children felt the IWB supported their thinking and learning. The sub-categories within this section are shown in figure 7. The majority of comments made by pupils were in the thought bubbles and appear to be evidence of pupils thinking about their learning.

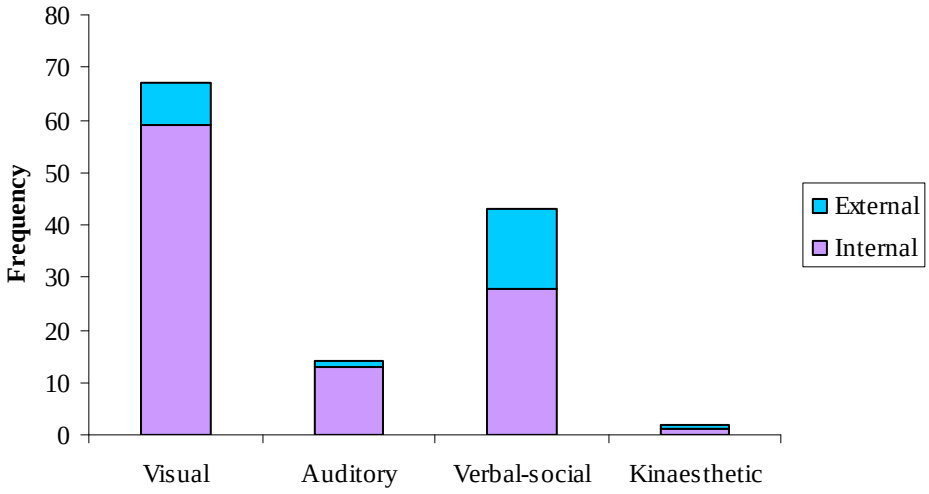

Figure 8: ***Sub-categories for 'learning styles'***

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 (Female, Age 10)

However, the social-verbal 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. 57% 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. (Female, Age 10)

Only 2 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 (Male, Age 10)

Software, hardware and multi-media 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. (Male, 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

facilitating 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 (Female, Age 11)

Many pupils mentioned different multimedia functions of the boards. 12% 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 (Female, Age 11)

Subject specific advantages

Many of the comments made by the pupils were subject specific (figure 8). Positive comments were most commonly made about mathematics (n=84). Pupils commented particularly on the 'shape, space and measure' aspect of the 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 (Male, 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 (Female, Age 11)

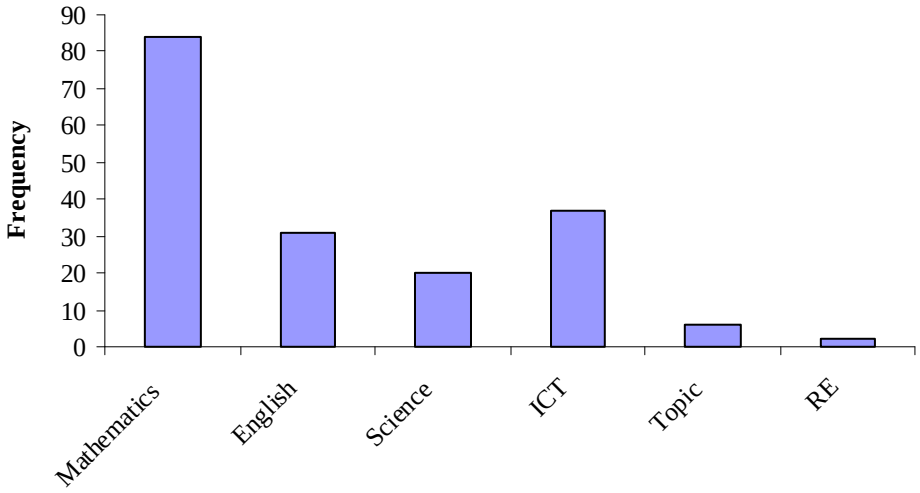

Figure 9: ***Subject specific positive statements***

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 (Male, 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. (Male, Age 11)

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

Science: it easy to understand because you can see something happening rather than someone telling you (Male, Age 10)

Benefits for teacher and pupils

The final area of positive comments we will discuss are the 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 (Female, Age 10)

Pupils also talked about the motivational impact on their teachers of the board, making them more enthusiastic and innovative:

The teacher is more inventive and more active (Female, 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 behaviour problems (n=33):

I think the interactive whiteboard helps children who behave badly and children who are not smart (Male, 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 9.

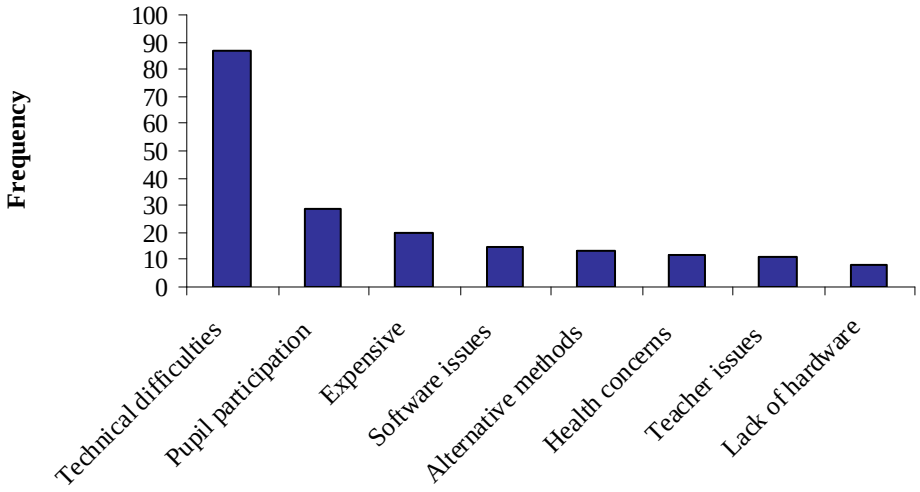

Figure 10: ***Tendencies within the negative pupil comments***

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 10). Complaints were commonly grouped under the generic term: 'break down'. Pupils from every school mentioned the fact that their board broke down.

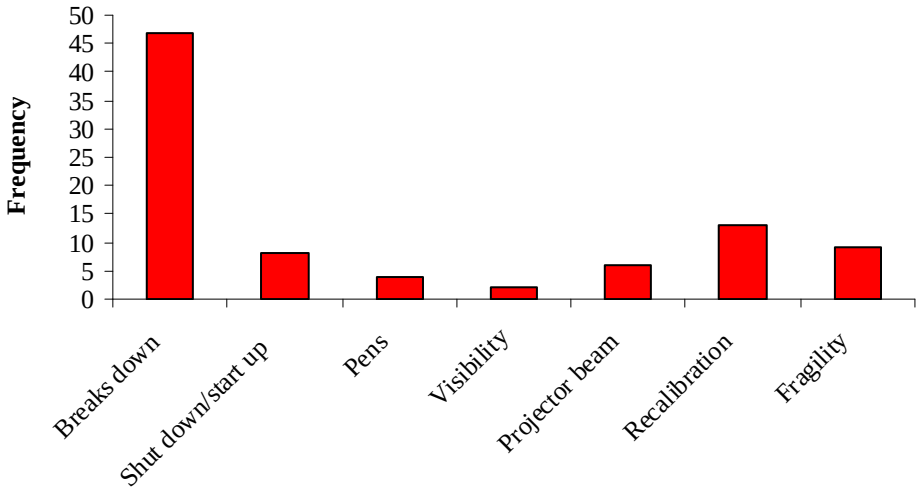

Figure 11: ***Technical difficulties with the IWB***

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 (Female, 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 IWBs cost:

It is not very good for younger children because they might fiddle and they don't know how much it costs (Male, 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 (Male, 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 which pupils' involvement was felt to facilitate. Many pupils mentioned that they would like to have a go, 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 (Male, 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 (Female, 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 (Male, 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 (Female, Age 11)

In fact on one of the completed templates a pupils added a thought bubble for the teacher saying 'stupid board' (see figure 11).

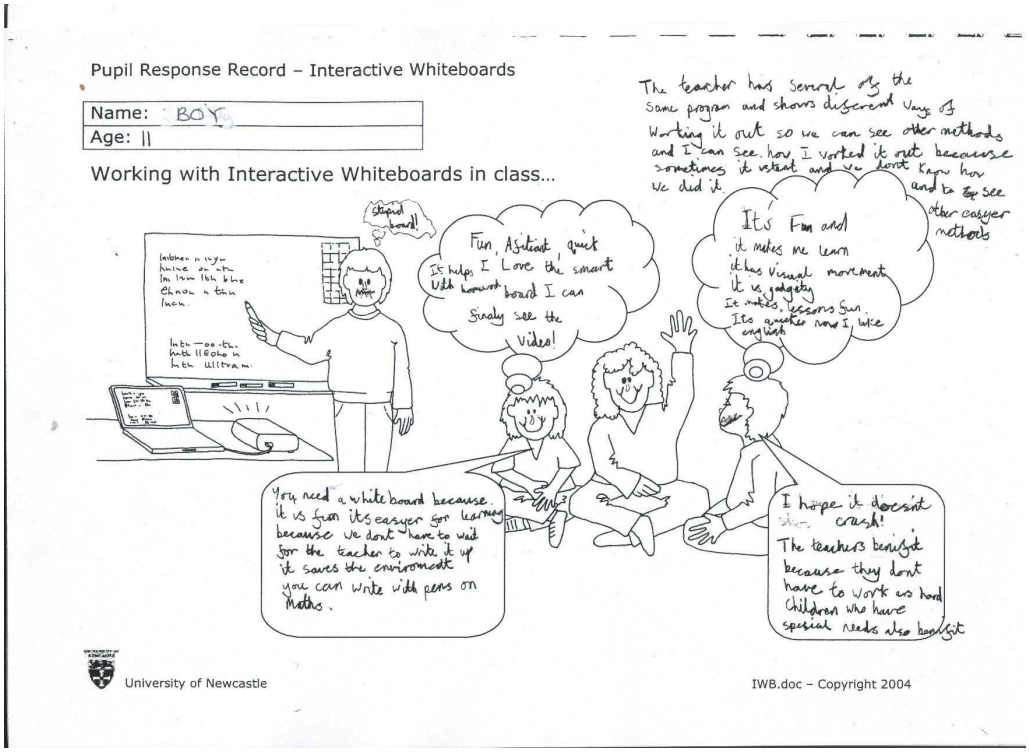

Figure 12: ***Completed template showing perceived teacher's feelings***

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 (Male, Age 11)

Conclusions

As stated at the onset, this is an area where pupils' views are not well known neither has pupil perceptions of metacognition been explored. The method 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.

If we assume for the sake of argument that the pupils' comments can be taken at face value, then there are some important implications. Teachers might be advised 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, with an important finding being the relationship between IWBs and pupils' views of their ways of learning, with visual and socio-verbal learning being prominent. The way in which information is presented, through colour and movement in particular, is seen as motivating and reinforces concentration and attention. Pupils also perceived that IWBs can influence the teachers themselves, both positively and negatively, and 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 are having on classroom processes. With regard to the software, pupils believe they were effective by tackling problems from different perspectives, by supporting memory and by supporting the teacher's explanation; these aspects need to be accentuated in future developments. Software deficiencies in English were commented on, with pupils more positive about using the IWB in mathematics and science.

Interactive whiteboards have been received positively by the pupils for many different reasons. Hence, the apparent impact on pupils' beliefs about learning and metacognition must be recognised and acted upon by both teachers and manufacturers.

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