

# Student perceptions of IWBs as a teaching and learning medium



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## ABSTRACT

*This article is an evaluation of the use of Interactive Whiteboards (IWBs) as a teaching and learning medium from the perspectives of students in Years 5 and 7 at Firbank Grammar School, in Victoria. It replicates a study undertaken in the United Kingdom by Wall, Higgins and Smith (2005). Fifty-six Year 5 students and 82 Year 7 students at the three campuses of Firbank used a Bubble Dialogue template to record their impressions about learning in a classroom where an IWB is used as a teaching medium. Qualitative analysis of the textual material written in 'thought' and 'speech' bubbles on the templates indicated that students have overwhelmingly positive responses to the use of IWBs in the classroom. It also showed that by Year 7 the students have developed a clear understanding of metacognitive processes and that the IWB facilitates their learning across different learning styles. Information relating to pedagogical practices using IWBs was also gleaned from the data. Teachers at the Year 5 level used the IWBs competently in diverse ways to engage their students, while teachers at the Year 7 level were developing competency. The research reinforces the need for ongoing teacher professional development in the use and integration of IWBs in the School curriculum.*

Early in the 1990s Firbank Grammar School accepted the arguments that its students must be equipped with skills that would enable them to participate in a technological society and developed programs to effectively integrate technology into the school curriculum. Yet, there was also a healthy scepticism of the 'boosterism' rhetoric surrounding the new technologies and consequently a determination to periodically review the use, and place of, technology in the curriculum. Critical evaluation has been a distinguishing feature of Firbank's technology program and when it was decided to install Interactive Whiteboards throughout classrooms ongoing evaluation and research was seen as an integral part of this new phase of the technology plan.

Interactive Whiteboards represent one of the latest innovations among the new technologies but rather than a single medium they represent the coalescence of a number of the new technologies. Known by the acronym IWBs, an Interactive Whiteboard combines a computer (desktop or laptop), a digital projector and a screen that looks similar to a conventional whiteboard but which is touch sensitive. A special pen activates software loaded on the system and anything that can be done on a computer can be done through the board. Over a 12 month period, 47 Promethean™ Interactive Whiteboards were installed in P-12 classrooms across the three campuses of Firbank with the understanding that Information and Communication Technologies (ICT) would be embedded in the curriculum.

Positive effects have been attributed to IWBs as a medium for both teaching and learning (Glover & Miller, 2002, 2003; Lee & Boyle, 2003; Levy, 2002).

Becta, which is a key partner in the strategic development and delivery of ICT and elearning in the United Kingdom, has also taken an interest in the research about the use of IWBs in teaching and learning and reiterated many of the research findings. In a paper released in 2003, Becta noted - the general benefits of IWBs included versatility increased teaching time by allowing seamless presentation of web-based and other resources, greater interaction and discussion in the classroom, and enjoyment of lessons for both teachers and students. For teachers the advantages offered by an IWB included the integration of ICT into a lesson while teaching from the front of the class, increased spontaneity and flexibility, and the ability to save and produce materials prepared collaboratively during a lesson. According to Becta there were four identified advantages for students: increased enjoyment and motivation, greater opportunities for participation and collaboration, decreased need for note-taking through the capacity to print from the screen, and the potential to cater for different learning styles.

In their review of the literature about the potential benefits of IWBs for teaching Smith, Higgins, Wall and Miller (2005) reiterated a number of these themes including flexibility and versatility, multimedia/multimodal presentation, efficiency, supporting planning and the development of resources, modelling ICT skills and interactivity and participation in lessons. Yet, it was also noted that many of these observations were anecdotal and they called for the collection of 'empirical evidence so that the processes of teaching and learning with this new technology [were] more fully understood and more coherently conceptualized' (Smith et al. 2005, p98). This collection of evidence has begun (for example see Higgins, Falzon, Hall, Mosely, Smith, Smith & Wall, 2005; Wall, Higgins & Smith, 2005), laying a basis for others in search of models to evaluate the effectiveness of IWBs.

The model eventually chosen for evaluation of the IWB program at Firbank is best described as multi-method. The intention of the evaluation was/is to collect data from a variety of perspectives, and over a period of time build a picture of the use of IWBs in the classroom. Early teacher perspectives were collected through a questionnaire distributed to all staff in May 2006 and from these a preliminary report was written (Erikson, Grant & Peat, 2006). This captured a picture of teaching with IWBs in the initial stages of the program and provided baseline data for comparison with later surveys. The teacher surveys were also used to inform decisions and planning for professional development (PD) for teachers in the use of IWBs with an intensive program of teacher training beginning in July 2006. The underlying assumption was that teachers need appropriate PD to effectively integrate technology into their classrooms and to adopt pedagogical styles that enhance their students' learning experiences using these media. This decision supports the claim that 'inadequate teacher expertise is the bottleneck in the application of ICT in education' (Kirschner & Selinger, 2003, p.10).

While the evaluation plan of the IWBs placed a high priority on teacher perceptions and practices it was considered equally important to elicit the views of students, especially while the technology was relatively new and there was a point of comparison (memories of classrooms that did not have IWB technology). The collection of data from students recognises two important principles; the importance of hearing all voices within the school community, and that students have a right to be involved in decisions that affect them. In the search for a methodology capable of capturing the opinions of students we became aware of the work being undertaken at the Centre for Learning and Teaching at the University of Newcastle (UK). Here pupils' views of learning and teaching, - with a particular focus on their thinking about their learning, were investigated. To tap into students' metacognition Wall and Higgins (2006) employed templates, created as psychological or semiotic tools, to form the basis of a mediated interview about the teaching and learning situation. The template uses a Bubble Dialogue comprising speech bubbles to support discussion on an issue under scrutiny and has been found to be a valid data collection methodology (Cohen, Manion & Morrison, 2007).

The methodologies used by Wall and Higgins (2006) were considered appropriate for the research at Firbank because it addressed not only IWB technology but also issues relating to metacognition, a recently articulated policy of the School. The development of a "thinking skills" focus in the junior secondary curriculum was informed by many sources. For example, in 2000 members of the newly formed Thinking Skills Group attended a four-day workshop organised by the Incorporated Association of Registered Teachers of Victoria (IARTV). The workshop, conducted by Atkin (1996, 2000), introduced the concept of integrative whole-brain learning which is based on the work of Ned Herrmann (1990) and to some extent is complemented by the work of Gardner (2000) and his theory of Multiple Intelligence. Herrmann's metaphoric model allocates the brain's specialised modes into one of four physiological structures. According to Herrmann's theory these four areas are associated with four thinking styles, which comprise distinct, thinking patterns; logical/analytical, planning/sequential, interpersonal/emotional, imaginative/holistic. The value of Herrmann's

model is its organising framework that recognises that cognition is not restricted to verbal and analytical skills.

The development of a thinking skills program in the junior and middle secondary years at Firbank was also informed by involvement in the Thinking Classrooms Project set up as part of the Australian Government Quality Teacher Program (AGQTP). Again this initiative came from participation in a series of seminars conducted by IARTV in 2001. Entitled Developing the Thinking Learner in the Middle School Years the seminars included workshops which introduced a number of critical thinking skills (see Reid, 1993). At Firbank the development of critical thinking skills and the whole-brain approach to learning were adopted as long-term projects aimed at 'encouraging students to be independent thinkers and learners' (Munro, 2003).

The understanding of metacognition that was accepted by the Thinking Skills Group focused on self-appraisal and self-management of cognition. The term "Self-appraisal" makes reference to the students' personal reflections about their knowledge states and abilities, and their affective states concerning their knowledge, abilities, motivation and characteristics as learners. Conversely, "self-management" refers to "metacognition in action" or the learner's active involvement in the orchestration of knowledge construction. In 2001 a team approach to curriculum implementation at Year 7 was adopted at Firbank; Students were introduced to the concept of Whole-Brain thinking and profiles of their individual learning preferences were developed. The teachers of the two junior campuses of Firbank, Sandringham House and Turner House, also work collaboratively on the development of curricula meeting frequently to integrate technology and thinking skills strategies into classroom activities.

In selecting an appropriate methodology to evaluate student perspectives of the usefulness of IWBs as a teaching and learning medium at Firbank, the work undertaken by Wall et al. (2005) which tapped into the process of metacognition had much to offer. A partial replication of the study pioneered by Wall, Higgins and Smith provided a multilayered investigation focusing on students' perceptions of IWBs as well as the exploration of the students' understanding of metacognitive processes.

## METHOD

**Participants:** Two year levels were chosen to participate in the study; Year 5 (n =56) and Year 7 (n =82).

**Materials:** a template (see Appendix 1) was used to elicit students' thinking about interactive whiteboards as a teaching medium. A flipchart (see Appendix 2) was used to explain the purpose of the research and to pose a series of questions to initiate discussion.

**Procedure:** In Year 5 students complete core subjects (Mathematics, English, Science, Humanities) with one teacher supported by specialist teachers. Data was collected from this cohort during lesson time. In the Senior School there are four classes at Year 7, which constitute the teaching groups. Data was collected from these groups during a 25-minute homeroom session.

Prior to the collection of data from both the Year 7 and the Year 5 groups, the purpose of the intended study was explained to the students who were given a letter including a Plain Language Statement and consent forms to be taken home to their parents. Data collection methods were the same for the different year levels with the flipchart used in the discussion being a means for increasing reliability across the interviews, as was the use of two researchers to collect the data from the different groups. The data collection involved discussion surrounding the flipchart and the completion of the bubble diagrams.

The flipchart began with the restatement of the purposes of the study, which was articulated as developing a better understanding of students' thinking about IWBs and learning. A second page showed the bubble diagram or template on which the students were to record their ideas and perceptions. The template showed a teacher at the side of an IWB and a group of 3 students working on the floor nearby. Two callouts on the bubble diagram were for recording the information. The thought bubble was an area where students could record information about their internal perceptions about learning (metacognition), while the speech bubble was a space where the students could write about their general ideas relating to IWBs. The fourth and fifth pages contained prompt questions for the discussion and were designed to assist students in the completion of the template.

## RESULTS

The responses were analysed by qualitative methods. The full responses for each participant were transcribed and the qualitative software package (Nudist Nvivo) used to analyse the textual material into nodes or themes of interest. There were three key areas of researcher interest:

- overall response to the use of IWBs in the classroom (speech bubble);
- the IWB and learning styles (thought bubble);
- teacher use of the IWB and issues relating to pedagogy.

### a) Overall response to the use of IWBs in the classroom

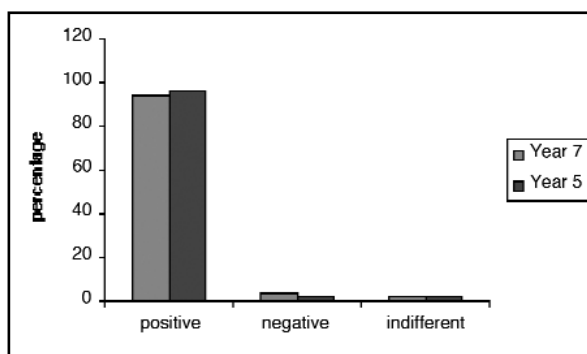


Figure 1: Students' perceptions of IWBs as a teaching medium

Figure 1 shows the majority of Year 7 students ( $n = 77$ ) responded positively to the use of IWBs and this trend was mirrored in the Year 5 cohort ( $n = 54$ ). These were made in the speech call-

out on the template and the following comments are typical:

*'The IWB can do a lot of things to help improve learning. Videos from the Internet can be played and textbooks can be put on the screen. It makes each lesson interesting and different.'*

*'It's good using the IWB because you can see things. You learn and understand it better.'*

A number of Year 7 students ( $n = 35$ ) referred to the IWB adding fun or interest to the lesson. For those who elaborated specifically on aspects of the lesson that were interesting, it was the use of movies and videoclips ( $n = 33$ ), access to the Internet ( $n = 7$ ) and games.

*'Using the IWB really helped me in maths because I like learning in a visual way. The teacher makes learning into games or goes through it really well.'*

Within the Year 5 cohort there was also a tendency to associate the IWB with fun ( $n = 31$ ) although this was generally related to the playing of games ( $n = 29$ ) and is typified in comments such as the following:

*'We always play maths games. I like the IWB because it is interactive. The IWB is fun.'*

The Year 7 students whose comments suggested a negative response to IWBs ( $n = 2$ ) were critical of the cost and technical problems and thought money would be better spent on other resources. At Year 5 only two students made negative responses about the IWBs claiming that they added nothing valuable to their learning experience and that they could see little difference to a standard whiteboard and were bored during lesson time. The three Year 7 students whose comments were categorized as "Indifferent" believed that the IWB added little or nothing to the classroom experiences.

### b) IWB and learning styles

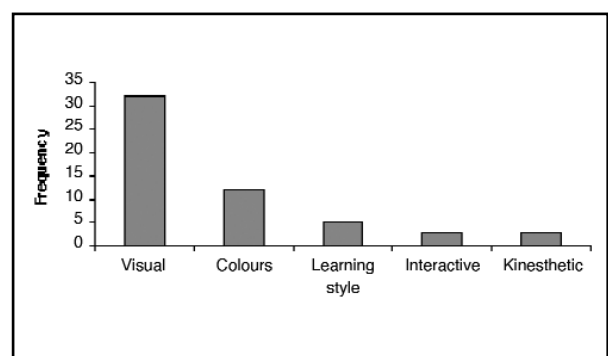


Figure 2: Year 7 Students' metacognitive talk about IWBs as a teaching and learning medium

Perhaps the most interesting aspect of the Year 7 students' responses was their ability to discuss metacognition; they were aware of what aided their learning and of their individual learning styles. Figure 2 shows the distribution of these responses; thirty-two students categorised themselves as visu-

al learners and saw the IWB as being a medium that supported this style of learning;

*'Using the IWBs I can get a better picture of the topic in my mind. If I don't understand something, the teacher can work through it step by step with me on the board and work out where I am making the mistake. The IWB helps me especially in maths where I learn better visually.'*

*'I learnt how to solve equations by the teacher using different charts and graphs to teach us. The IWB helps me learn by showing me how certain things are done.'*

*'From the IWB I learned that I am a visual learner. I work better when I see all parts of a problem at all times and can reread it without holding up the class. I was able to achieve working more quickly without forgetting info.'*

Figure 2 shows a number of students ( $n = 12$ ) referred to 'colour' and saw this as an attribute of the IWB that aided their learning:

*'It is fun when she [the teacher] lets me use it. I get it how the green is for the fact and the red is for fiction. I liked reading what I had to learn...'*

*'I am a person who learns visually so the IWBs helps me see diagrams in colour. Maps and diagrams are the best thing to use on the IWB.'*

Other evidence of student metacognition is seen in the comments that make reference to the kinaesthetic process of learning;

*'When I get to get up and use the IWB I learn better than when I have to sit there and listen. Labelling pictures helped me learn.'*

The use of an IWB also enabled students to utilise learning strategies other than their preferred style as shown in the following statement:

*'I learnt how to find other ways of finding the answer. Learning how to think in other ways and becoming more confident to say the answers. I like learning using the IWB because we can be part of teaching instead of the teacher just talking.'*

The year 5 students were less able to articulate on their metacognitive processes and this was reflected in their general inability to differentiate between the 'speech' and 'thought' bubbles on the template. However, there were students with awareness of a preferred learning style. Nine students referred to themselves as visual learners or as benefiting from being able to see the work set out on the board, while a few ( $n = 6$ ) commented that the IWB facilitated collaborative learning. Surprisingly, and offering a different perspective to the older cohort, were five students who mentioned the audio facility of the IWB as assisting their learning. The statements of the Year 5 students who were able to comment on metacognitive processes mirrored those of the older cohort;

*'I like it when we use the IWB because I like visualising and being able to go through things with the teacher and other class mates.'*

*'I learnt that you can learn in another way. Use new strategies.'*

### c) Teacher use of the IWB and issues relating to pedagogy.

Much could be gleaned from the students' responses about classroom practices and teacher pedagogy and there were significant differences between the responses made by the Year 5 students compared to the Year 7 students. It was evident from the Year 5 responses that the classroom teacher used the IWBs extensively and in diverse ways. For example, the students commented on the use of the timer as a classroom management strategy; this involved the teacher setting the clock and providing a timeframe within which students were expected to settle to a task. The students responded well to this strategy.

The teachers of Year 5 also used the IWB across a range of curriculum areas. The students mentioned use of the IWB to teach poetry, analysis of text, to brainstorm and create mind maps in Humanities, and as a research tool, but according to the students the most effective use of the IWB was in the teaching of Maths. More than half of the Year 5 respondents ( $n = 33$ ) referred to the use of the IWB in Maths. Frequent reference was made to the IWB being used to teach about the function of the x and y-axes and how they could 'easily see it when it was plotted on the graph'.

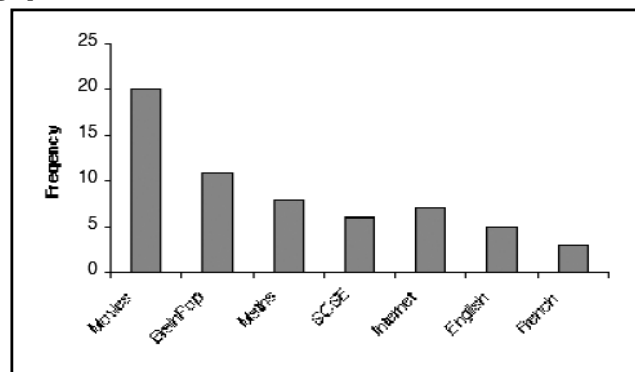


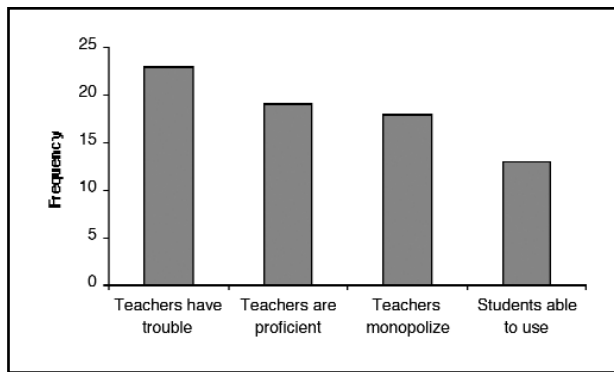
Fig 3: Statements of Year 7 students relating to Subjects and programs

Figure 3 shows that within the year 7 cohort, a number of students made reference to the use of the IWB in specific subjects. As with the Year 5 students, the subject of Mathematics was referred to specifically and on all occasions the students made positive comments about how the teacher's use of the IWB helped them in this subject.

*'I learnt how to do algebra. It helps me to understand the subject'*

The same relationship held for all other subjects too; if a student mentioned a subject by name they also referred to how the use of the IWB had helped them understand that subject better. Implied in these positive comments were perceptions that the teachers were skilled in the use of the software. Almost 25% of the students ( $n = 20$ ) referred to the use of multimedia in their responses and claimed that these made the subject more interesting, reinforced learning and maintained their interest.

BrainPop®, a software program that includes short video-



clips and interactive quizzes was a favourite.

**Figure 4: Teacher proficiency and predominant use of the IWB**

However, Figure 4 shows a number of Year 7 students ( $n = 23$ ) commented on the teachers' lack of skills with the IWB as seen in comments like the following:

*'Some of the teachers need to learn how to use them. It is good using them because we can go up and do things on them. Sometimes the teachers can't find their files so it takes a lot of time, which could be spent doing other things'*

*'Sometimes it is annoying because some teachers have no idea how to use it and they won't let us help. But it's fun when they know how because they can do creative things to make things easier for learning.'*

Yet other students ( $n = 19$ ) commented positively on their teacher's use of the IWB.

*'My teacher writes on the IWB most of the time... my teachers uses pictures on the IWB to help explain things.'*

*'It helps the teachers save time on writing on a normal board because they already have the information on a document.'*

In contrast the Year 5 students acknowledged their teachers' proficiency with the IWB as evidenced in their comments about the range of tools they accessed to teach different concepts. There were only three students among the Year 5s who mentioned technical difficulties. The Year 5 students were also anxious to use the IWB and thought that they benefited from coming to the board to demonstrate a concept or share a piece of work.

Student comments on the templates indicated that they clearly liked using the IWB themselves although some of the Year 7s ( $n = 18$ ) believed that teachers were 'monopolizing' the board.

*'I wish that we got to draw on it more or draw on the slates.'*

*'Our teachers don't let us use them very often and if you have a go at them it helps you see if you are learning the right information.'*

There were a number of students ( $n = 15$ ) who made reference to the positive benefits of students 'actually' using the board and it was a frequent desire for this to happen more often in the future.

## CONCLUSIONS

This phase of the evaluation of IWBs at Firbank, involving the views of students in Years 5 and 7, adds to the literature about this new innovation in technology. The results support findings reported in other research (Becta, 2003; Lee & Boyle, 2003; Glover & Miller, 2002, 2003; Wall et al, 2005; Wall & Higgins, 2006) that an IWB can be an effective tool for initiating and facilitating the learning process. The voices of the students in this study indicate increased student engagement when lessons are delivered on the IWBs; they refer to the versatility of the software, the colour and movement brought to lessons. Overwhelmingly, the students claim lessons are more exciting when the IWB is used as the mode of delivery.

The research indicated that the Year 7 students at Firbank understand their own learning and that some Year 5 students are also aware of metacognitive processes. This finding supports the research of Wall and Higgins (2005) that semiotic tools, such as Bubble Diagrams, facilitate student talk about metacognition and reveal that by early adolescence students have acquired an understanding of how they learn best. The students' ability to articulate their ideas about learning and their use of terminology such as 'visual', 'sequence of steps in learning' and 'shared understanding' show an appreciation of the personal agency they bring to the process of learning. The students' use of terms like 'labelling', 'problem solving' and 'sequencing' (terms used in the Thinking Classrooms Project) show engagement with higher-order thinking skills.

The Year 7 students' comments about the difficulties their teachers have in using the IWB should not be dismissed, even though it was evident that often the students confused technical malfunction of the board with the teacher's lack of skill. This finding demonstrates the - importance of ongoing professional development to address the dual aims of improving teachers' efficiency with new technologies and providing opportunities and time to investigate applications of these in their classrooms. This recognition that the pedagogical aspects of using technology effectively are just as important as increasing teachers' technological skills has informed Firbank's planning for professional development in ICTs. The model adopted is best described as 'situative-based' or 'social constructivist' in orientation. This model has been described by McCormick and Scrimshaw (2001) as 'communities of learners working collaboratively in social activity'. At Firbank this has involved releasing teachers in faculty groups to work with a facilitator to develop resources for use in the classroom. These learning communities have meant that the teachers are able to learn about, and with, the technologies that they recognise as pedagogically sound and relevant to their needs. One area that possibly still needs investigation is in helping Senior School teachers to 'let go' of the operation of the board and involve the students more actively so that those who learn kinesthetically have the opportunity to enhance their learning through their preferred style.

The research undertaken by Becta (2003) identified four advantages for students: increased enjoyment and motivation, greater opportunities for participation and collaboration, decreased need for note-taking through the capacity to print from the screen, and the potential to cater for different learning styles. The research with the Firbank students show that the first and fourth advantages have been realized while there is a need to increase the opportunities for student access to the board. IWBs present an exciting innovation for Australian students: they have demonstrated a capacity to engage and motivate students, and there is recognition by students that this form of new technologies enhances learning experiences. It is important that teachers are provided with, and continue to participate in, PD to explore opportunities to exploit the potential of IWBs.

## BIOGRAPHY

**WENDY GRANT** is the Director of Curriculum at Firbank Grammar School and a Senior Mathematics teacher. Her responsibility involves the planning and implementation of curriculum across the three campuses from ELC3-12. In recent years Wendy has guided the successful introduction of a number of curriculum initiatives, including the IB Primary Years Programme. She has also worked with academics from the tertiary sector in the development of programs to encourage Firbank students as independent thinkers and is interested in devising strategies which facilitate and extend higher-order cognitive processes. Wendy takes an active interest in research as a means of informing effective classroom practices.

**DEBORAH ERIKSON** is the Deputy Director of Curriculum at Firbank Grammar School and Head of Humanities. Her belief that teachers should combine theory and practice has seen her undertake a number of post-graduate courses at Victorian Universities. In 2005 she was awarded a PhD for her thesis entitled 'A Case Study of the integration of ICTs into the School Curriculum' which examined the ways in which teachers use technology to enhance teaching. In particular, the thesis investigated the pedagogical issues relating to teacher mediation of technology and examined models of professional development for ICTs.

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## APPENDIX 2

Flipchart used in data collection

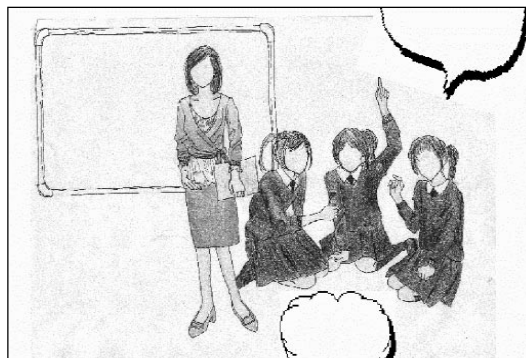
### IWB EVALUATION

I am interested in your thinking about learning.

I am going to lead a discussion about IWBs and learning.

When we finish the discussion I want you to spend quiet/individual time recording your ideas about IWB on the bubble dialogue.

I will show you the bubble dialogue and explain what I want you to do with it.



There are two "callouts" on the bubble dialogue where you can write.

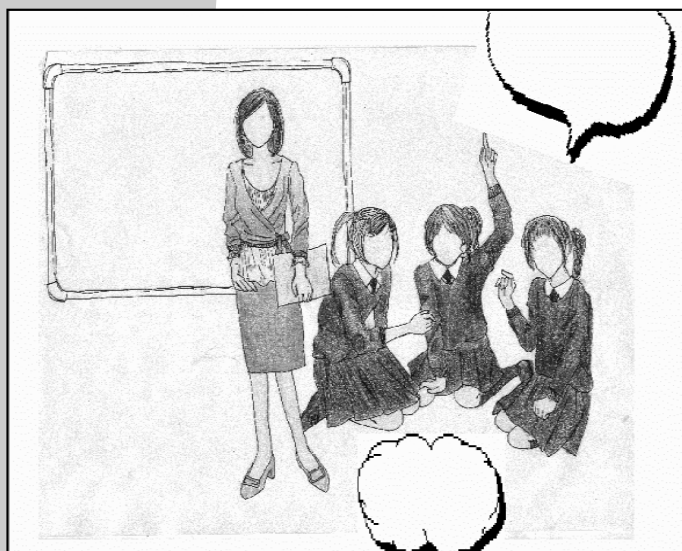
One callout is a thought bubble where you write about your "internal" thoughts about IWBs and how they help you learn.

where I write about my learning

The other callout is a speech bubble where you write about how the IWBs affect the learning of other students and general ideas that you have about IWBs.

where I write about others' learning and general things about IWBs

## APPENDIX 1



### Thought Bubble questions

- 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 type of things were done on the IWB that helped you learn?
- How does the IWB help you learn?



### Speech bubble questions

- what does the teacher do on the IWB?
- what was good about using the IWB?
- what was not so good about using the IWB?
- Why would you tell another school/teacher/child to use the IWB?

