

INTERACTIVE WHITEBOARDS FOR STUDENTS WITH SPECIAL NEEDS



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Introduction

The interest in interactive whiteboards (IWBs) for classroom use has exploded over the past eighteen months to two years. This interest has spread to the use of these boards with students with disabilities. In 2005, Education Queensland's Smart Classrooms offered grants to Queensland schools to implement projects that utilized Information and Communication Technologies (ICTs) to support students with disabilities. From 170 grant applications received, 27 of these proposed projects incorporated an interactive whiteboard. This was the largest category within the grant applications. There is clearly a significant interest in IWBs for using with students with disabilities and within inclusive education settings.

As with any new technology, there are a number of issues and considerations to be made, as well as variations within the technology itself. It is important that the appropriate type of IWB is selected for the environment and use. As with any technology, if the wrong IWB is selected, teachers will be reluctant to use the technology and students will not interact effectively.

In this document, we will explore the various types of IWBs and projections systems, discuss the things you need to consider before purchasing an IWB, and provide some strategies in how to get the most out of your investment to support students with special needs.

What is an Interactive Whiteboard System?

Before we get into the details, let's identify what an Interactive Whiteboard system is.

An Interactive Whiteboard is any system that records and displays electronically, information written on the whiteboard, and the interaction with the whiteboard by the user.



Interactive whiteboard system components

All IWB systems must have a number of components.

A whiteboard surface

This is the main component of the system and the part that most people think of when referring to an IWB. The whiteboard may be a special whiteboard surface that you purchase with the system, or a regular whiteboard that may already exist in the classroom. If a regular whiteboard is being used, the electronic components used with the whiteboard make it into an interactive whiteboard.

A means of identifying the interaction with the whiteboard

This is the component that picks up when the user is touching or drawing on the whiteboard and translates this movement to the computer system. This interaction usually relates to when the user writes on the whiteboard with pen but could also include the interaction with the computer display projected onto the whiteboard. Identifying and translating the interaction may be done by the whiteboard surface itself, or by a signal sent to a receiver by a special pen.

A computer

While the computer is not usually purchased with the system, it is a necessary part of the IWB system. Without the computer, the IWB just becomes a regular whiteboard. The computer has a number of functions within the whiteboard system:

- Record the information written on the whiteboard;
- Run the software that is used by the IWB;
- Run the software that will be used in the interaction.

The computer may be used while the student is interacting with the whiteboard but may not be required until after the learning session has been completed. In this case the information can be downloaded from the IWB system to the computer.

A projector

Many consider the projector as a necessary component of an IWB system. Depending on the activity, a projector may or may not be required. It is the activity and student interaction that will determine if projection is required. If the activity does not require projection but requires the interaction to be recorded or displayed on a computer, software that simulates the whiteboard surface is used. The student or teacher uses the whiteboard pen suitable for the type of surface to produce the writing on the whiteboard. The whiteboard then sends the information for recording through the computer's virtual whiteboard software. In other activities, the information written on the whiteboard may be recorded by the computer for later use, or the information may be networked and displayed on the student's computer system.

Where the computer screen needs to be displayed, some form of projection or visual display will be needed to display the information on the whiteboard to enable the teacher and student to interact with the information provided from the computer.

Modes of operation

Although the strategies for using IWBs are as varied as the learning activities in which they can be used, there are two general modes of operating IWBs.

Whiteboard recording mode

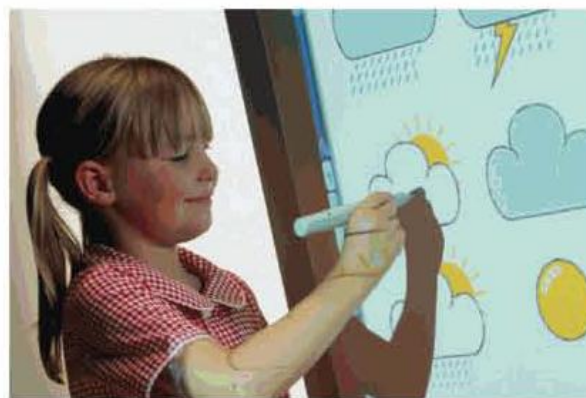
Most IWBs provide some means of recording what the user does on the whiteboard. In this mode the IWB is used as a regular whiteboard, using pens or some other means of drawing to place information on the whiteboard surface or whiteboard display projected onto the whiteboard. The

text and diagrams drawn on the whiteboard are recorded onto a computer as they are drawn, or downloaded to the computer at a later time. In this mode it is not always necessary to have a projector.

The text and images are placed onto the whiteboard in one of two ways:

- **Direct.** The text and images are drawn directly onto the whiteboard using ink from regular or special whiteboard pens. No projector is used in the direct mode;
- **Virtual.** The text and images are projected onto the whiteboard based on the user's interaction with the surface.

All IWBs will come with software that allows the information written to the whiteboard to be displayed either directly or virtually, and to be recorded or downloaded to the computer.



Touch screen mode

When used with a projector, most IWBs will allow the whiteboard surface to be used like a giant touch screen. When the user touches the surface the mouse cursor will move to the new location. The user can carry out, on a large, interactive scale, functions such as clicks, double clicks, right click, drag and drop. All the functionality of the computer is available through the whiteboard.

Most IWBs also come with an onscreen keyboard that allows the user to enter text onto the screen without using the regular keyboard. The user “types” by touching the keys as they are displayed on the projection of the computer screen.

Some IWBs also allow you to make notes and annotate the computer screen to emphasise the parts of the screen. These annotations can then be saved as an image for later use.

The different ways of sending information to the computer in either recording or touch screen mode, are described in the “Surfaces and signals” section of this booklet.

Types of Interactive Whiteboards

Many people think that there is only one type of IWB with perhaps some variation in the size of the whiteboard. There are, however, a large range of IWBs with each style providing various features. Each system had advantages and issues that you need to consider.

Variations

IWBs vary in:

- Projection. Systems can be either rear projection, front projection or no projection;
- Surface and signal. The IWB surface can be hard or soft. The signal can be sent to the computer by the surface itself or by the writing implement;
- Portability. How portable the IWB system is; and
- Software that comes with the package.

Listed below are the variations in IWBs, with the features, advantages and disadvantages of each type. It is important that each type of IWB feature is considered when choosing an appropriate system.

Projection

Rear Projection

Rear projection IWBs have their display projected from behind the whiteboard. The projector is part of the IWB system.

Advantages

No shadow is thrown onto whiteboard. This means that the whole whiteboard can be seen at all times regardless of how many users are interacting or where they are positioned.

Rear projection IWBs require less space for projection. The projection is usually less than $\frac{1}{2}$ a metre, whereas other systems may require a greater distance for projection (this is dependent on the projector being used - see the section on Short Throw Projectors).

As this system comes with its own projector, it does not require the purchase or availability of a projector.

Some rear projection systems are portable, while others are wall mounted.

Disadvantages

The rear projection system is much more expensive when compared to front projection systems. They are more than twice the price of most front projection systems, although they also include the projector.

You cannot use the projector separately to the whiteboard. In most schools, the projector is used for more than just an IWB. With rear projection systems, you would need another projector for other uses (e.g. projecting TV or video).

With some systems, there is limited access for wheelchair users. The system may not allow a wheelchair user to be positioned under the whiteboard for better access to the surface.

Rear projection systems are bulkier and more difficult to move than other IWB systems.



Front Projection

The image from the computer is projected from a data projector that is not contained within the whiteboard itself. This projection can be placed on a desk or table, or be suspended from the ceiling.

Advantages

The size of the display can be adjusted to suit the environment and user.

The projector can be used for more than just the whiteboard.

The cost of this type of system is usually much cheaper than rear projection, even though you will need to purchase the projector as well as the IWB itself.

Disadvantages

The main problem with front projection systems is shadow. The user stands between the whiteboard and the projector. The light from the projector throws a shadow of the user onto the whiteboard. Information will be hidden by the shadow and it may be difficult to locate specific areas of the information being projected. Students who are either in wheelchairs, or who do not have the ability to stand to one side and interact with the whiteboard will find their shadow being cast onto the information they are wanting to interact with.

No Projection

No projection whiteboards have only just recently been released. They are a plasma style display with built in sensitivity to react to the users touch. They basically look like a plasma TV but are designed for the computer and will manipulate the mouse functions when the user touches the plasma surface.

Advantages

There is no shadow thrown by these devices.

The unit is much narrower and lighter than rear projection and many front projection systems.

The unit usually comes on an adjustable stand to allow them to be used by students of varying heights or by students who are in a wheelchair.

The image quality is excellent and has no “bright” projection spot.

The screen does not need to be calibrated every time it is relocated.

There is no fan or other moving parts on the display. This makes it much quieter and has less maintenance requirements of parts.

Disadvantages

The plasma technology of these no projection devices make them very expensive when compared to other systems.

The surface of the plasma screens are not designed to be written on using a whiteboard pen and therefore cannot be used as a regular whiteboard.

Surface and signal

The surface type of all IWBs determines how the whiteboard produces the signal that gets sent to the computer. More importantly for students with special needs, it also determines how the user interacts with the whiteboard and what can be used to produce the signal.

Softboard

A softboard is made up of a soft membrane surface on top of another harder surface. These two surfaces have sensors located on them that send a signal to the computer when the user touches the whiteboard and contact is made between the two surfaces. It is a process that is very similar to many touch monitors or touch screens.

Advantages

Contact, and hence the signal sent to the computer can be produced by any object. The finger, hand, or any part of the body will send a signal. Devices such as head pointers, handles, or other pointing devices will also activate the surface.

Most softboards allow for the use with whiteboard pens and can be used as a regular whiteboard.



Disadvantages

Only one point of contact can be made with the softboard at any one time. The softboard will send inconsistent and incorrect signals to the computer if multiple points of contact are made at any one time.

Because of the soft surface, softboards are less durable than hardboards or other systems and are more susceptible to damage.

Hardboard

Hardboards have a solid surface similar to that of a regular whiteboard. The position of the marker is sent to the computer by a signal emitted from a special whiteboard pen to a receiver on the whiteboard.

Advantages

Hardboards basically have the same surface as a regular whiteboard. They are very tough, especially if you have students with a heavy touch or poor control over their movements.

Disadvantages

The hardboard system requires user to be able to use the signal pen in order to interact with the whiteboard. This means they have to have the capability of either holding the pen or use some type of device that will hold the pen for the student.

In many hardboard systems, the pens require batteries in order to send the signal to the whiteboard receiver. These batteries, like any other battery, will need to be either replaced or recharged on a regular basis.

Portability

As most schools are on a budget and are unlikely to be able to provide each classroom with an IWB, portability may be a significant consideration when purchasing an IWB system.

Most IWBs can be either wall mounted or attached to a trolley similar to those found on some regular whiteboards. There are also other IWB systems that do not require their own whiteboard but instead use existing regular whiteboards.

Portable Whiteboard Recording Systems

These systems are quite different to the Interactive Whiteboards that most people are familiar with in that they do not include a whiteboard. Portable Whiteboard recording systems make use of existing whiteboards to record the movement of pens. This movement is then downloaded to the computer, either immediately or at a later time, or displayed by projection.

The device itself is usually a small piece of hardware that is attached to a regular whiteboard, usually by suction or brackets. Special cartridges hold the whiteboard pens. The cartridge sends a signal to the receiver attached to the whiteboard to indicate the position of the pen. This position is recorded by the device and either sent to the computer or stored in the device itself for downloading at a later time.

The system of operation with this type of device is very similar to that of a hardboard system, except this system can be used on any whiteboard.

Examples of these portable whiteboard recording systems are the Mimio and the eBeam.



eBeam



Mimio

Advantages

As the device is usually no bigger than a pencil case and quite light, it is extremely portable. Many students with special needs keep the device in their bag and give it to the teacher to record the whiteboards of the lesson. The student then downloads the whiteboards to their computer at a later time.

These devices are a lot cheaper than other IWB systems. These systems can be purchased for around \$1000.

The portable whiteboard recording systems can be used with any regular whiteboard. It can therefore be used in most classrooms and does not require a large whiteboard to be moved from one classroom to another.

The system does not require the device to be connected to a computer to record the details of the whiteboard. Some classrooms may not have access to a computer near where the whiteboard is situated. The whiteboard itself can store numerous whiteboard images that can be downloaded to a computer at a later time. This is ideal where the student has difficulty taking notes and listening to the teacher at the same time.

Because the system can record whiteboard information without a computer, there is also no need for a projector in these circumstances.

Disadvantages

The device works on a signal being sent to the receiver by the special pen whiteboard pen holders. As a result, the user must be able to hold and operate the pens. The pen holders may take regular whiteboard pens but sometimes special pens that are specifically designed for the holders are needed. The pen holders also require battery power in order to transmit the signal. The batteries will need replacing or recharging on a regular basis.

Wall Mounted Systems

Wall mounted IWBs are bolted or screwed to a wall or permanent frame within a room. While they can be moved by unbolting the system, it has been designed to remain in one place.

Advantages

When there is a permanent wall mounted system, there is usually little need to set up the whiteboard. It is usually associated with a permanent computer and projector. These three systems, once set up, do not require the user to make any adjustments. This saves the user time. The user also does not have to worry about the system functioning correctly.

It is less likely that a wall mounted system will be damaged. Portable systems may be dropped or fall over when being moved.

Disadvantages

Wall mounted systems are much less portable. This means that the IWB can only be used in the room where the system is located.

The wall mounted systems have no flexibility regarding their height or the distance available behind the whiteboard. Students who are short or who may be in a wheelchair may not be able to access the whiteboard. Because it is fixed, the teacher has no ability to adjust the whiteboard to suit the user.

Trolley Frame systems

Trolley systems are a frame that allows the IWB to be wheeled from one location to the next.

Advantages

The system can be moved relatively easily between classrooms. This means that the IWB can be used in any location where it will physically fit.

As the trolley can be moved from one location to another, it can be positioned more effectively within the classroom itself. It could be used for whole group activities, to isolate groups that may be doing whiteboard work or for individuals.

The trolley can be positioned so that students can access the whiteboard more effectively. The height and position can be adjusted to suit students of varying heights or for students that might be in a wheelchair.

Disadvantages

As the position and distance of the IWB in relation to the projector will vary, the system will need to be adjusted, calibrated and configured every time it is moved. This means that the teacher using the IWB will need to be able to configure the system each time it is relocated. This not only includes the calibration of the whiteboard but the positioning of the projector if one is being used.

Anything that is portable is more likely to be damaged during transport. Although many of the portable systems are quite stable they are still more prone to damage than that of a more permanent setup.

Software

All IWBs come with software that allows the user to interact, record and display information from the whiteboard. There are numerous applications that are in IWB packages. Listed below are some general areas of the IWB software.

Whiteboard recording software

This is the software that comes with the IWB that records the information produced on the whiteboard. It usually displays a virtual representation of the whiteboard surface. When the user draws on the whiteboard the pen strokes are recorded in the software. This virtual image of the whiteboard markings can then be saved as a file for later use. The software will usually come with a suite of tools that allows the user to choose pen colour, line style and thickness, as well as erasers and other formatting and editing tools. The whiteboard recording software is the only software that can be used either with or without projection when it is being used in conjunction with the whiteboard.

Computer interaction software

This software provides the opportunity to enable the user to use the IWB to interact with the computer. It basically allows the user's interaction with the whiteboard to take over the functions of the mouse and keyboard. When the user touches the IWB the software will carry out the computer function related to that action. The mouse functions could include a mouse click, double click, right click, and click and drag. The software will usually include an onscreen keyboard to allow the user to enter text into other software without returning to the computer's keyboard. Annotation tools are often included to allow the user to make notes directly onto the screen being displayed on the IWB. Computer interaction software must have a projected image of the computer screen on the whiteboard.

Curriculum software

This is software that focuses on providing curriculum activities that specifically benefit from the use of the IWB. While any software application can be used with an IWB, these packages specifically enable the student to develop their learning opportunities by interacting with the IWB. Most IWB curriculum packages are offered as an optional package with the IWB.

Broadcasting or conferencing software

The use of the IWB can be networked or broadcast to numerous computers either in the same room or in other school buildings or in fact anywhere in the world via the Internet. The software can produce an image of the whiteboard on numerous computers and can be shared across networks. This has significant advantages to learners when remote teaching is required.

Supportive software

Writing recognition

Writing recognition is the process of taking the information written on the whiteboard and translating it to computer text. This translation can then be used in other applications or be read by text recognition software (See section on vision impairment).

Animation

Some IWBs have tools that will replay the various pen strokes that were used on the whiteboard. This allows users to see how an illustration was produced on the whiteboard. It also is useful when a sequence is being illustrated on the whiteboard. Sometimes the whiteboard illustration does not provide enough information. The process of how the illustration was produced may also be important. The animation software animates the drawing so the student can see the sequence of the illustration.

Projectors

As the majority of IWBs work with some type of projection, it is important the projection system is both compatible and complements the whiteboard system itself. There is little advantage of an effective IWB if the projector system does not suit the whiteboard or the environment.

As with the whiteboards themselves, the projection systems also vary and must be considered so the teacher and students can get the most from your IWB. Given below is some brief information about the various aspects of projectors. You should discuss the various features in more detail with your supplier as to the best projector for your school or classroom.

Brightness

The brightness is fairly self explanatory, as it relates to how bright the image is projected. In brightly lit classrooms, you will need a brighter projector than in classrooms where the light level can be controlled. The brightness of projectors is measured in Lumens, with a typical projector about 2000 Lumens.

Projection method

There are two basic forms of projecting the image from a projector:

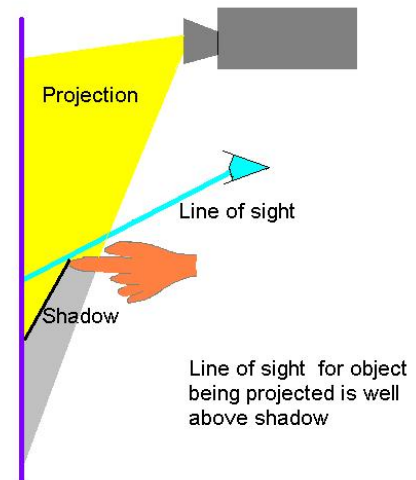
- DLP (Digital Light Processing). DLP projectors are better suited when projecting video or TV images;
- LCD (Liquid Crystal Display). These projectors suit better a primary use with computers. They are more align with a regular computer monitor.

Although these two types of projection are better suited to certain media, they can project images from any source and, in many instances, the difference is minimal.

Short Throw Projectors

Short throw projectors are systems that produce a large projection image when the projector itself is a short distance from the whiteboard or projection screen. Some short throw projectors can create an image that is 150 centimetres (about 5 foot) across, from only 26 centimetres (less than one foot) from the screen.

There is virtually no shadow thrown onto the whiteboard from a short throw projector. Because the projector is so close to the board, the angle of the shadow is much greater and therefore a much larger distance from the location of the image being projected. This is even more apparent when the projector is ceiling mounted (see figure).



Less space required to throw the same size image. You don't need to have metres between the projector and the whiteboard to get a large image. This is useful where space is limited.

Short throw projectors are best used when they are ceiling mounted which means they are less portable. Frames that position the projector over the whiteboard are available or could be made to make the short throw projector more portable.

Things to Consider Before Selecting Your Interactive Whiteboard System

Budget

Your budget is going to be a significant factor in choosing your IWB system. An IWB system is going to cost anywhere from \$1000 to over \$10 000 depending on the type of system and whether a projector is already available. While the most appropriate IWB system should determine how much money is allocated in a school budget towards the system, it is often the budget that determines the system. This may cause the money to be spent on an inappropriate system.

Environment

There are many aspects of the environment in which the IWB will be used that you will need to consider before choosing a system.

You need to consider how much space you have available for the system. If space is limited, then either a rear projection or short throw projector may be preferable. The space may also determine the size of the whiteboard.

The location of the whiteboard in the classroom may be affected by strong or weak light. This may determine the type of projector that is appropriate and the brightness that will be required.

Portability

In schools where only one or two IWBs will be possible, it may be necessary to choose a system that is highly portable. When you consider various portable IWB systems, consider not just the portability of the whiteboard but the projector. If you plan to ceiling mount your projector, it also restricts the portability of your whiteboard.

Access by students

Many IWB systems can limit the access for students.

Access limitation may be in the location of the whiteboard. Wall mounted IWBs may not allow shorter students or students in wheelchairs to access the whole surface. Large whiteboards can also limit their effectiveness when a student has limited movement.

If a student is unable to grasp a whiteboard pen, they may not be able to use an IWB system such as a hardboard or portable whiteboard recording system that requires the use of a pen. Special devices may be required in order to hold the pen.

Cable or IR

The various IWBs connect to the computer using either a cable or Infra Red (IR). Whilst the cable is easier and cheaper to use, the position of the IWB may be restricted to the length of the cable to the computer. IR systems can usually be positioned a greater distance from the computer but require the computer to be in sight and are more expensive than cable.

Networking

There are many benefits to using an IWB within a computer network. The interaction with the whiteboard can be shared across computers within the network. The student does not have to be in the same room to view the writing and illustration being carried out on the whiteboard.

The various IWB packages have different network and broadcasting capabilities and should be considered where network or remote learning is going to take place.

Software

Most companies that produce IWBs also provide software to be used with the whiteboard. The software may be part of the package but is usually an optional extra. Some of the software packages are useful on their own and extremely effective when used with the IWB. Assistive software such as writing recognition and whiteboard animation software may also be a consideration when purchasing IWB packages.

Permanency of classroom environment

Special education classrooms are probably one of the most transient rooms in relation to the layout of the learning centres. Desks, chairs, tables, beds and other classroom furniture are often moved for the various activities that take place in a special education classroom.

By selecting an IWB system that requires a form of permanency (e.g. ceiling mounted projector), the flexibility in the learning environment is restricted.

Why Use Interactive Whiteboards?

Highly visual

For some students, it is necessary to provide visual format for information. The interaction with the visual material means the students “experience” the learning and are more likely to retain it.

Highly engaging and motivating

The students become much more engaged in learning when teachers incorporate IWBs into activities. Studies have shown a direct correlation between the level of engagement of students in the learning activities and the use of IWBs. Student attention levels also improve when IWBs are part of the learning strategies. Students are more likely to attend to the tasks that use IWBs.

Provide conceptual links

The interactivity of an IWB makes connections for students between concrete and abstract learning. As students experience the almost “hands on” of the IWB, they develop and understanding of abstract concepts associated with the learning.

Support collaboration

Students engage more effectively in group work and collaborative learning when an IWB is used within the activities.

Develop students desire to learn

Enable greater interaction with other technologies

While the Internet is already an interactive medium, incorporating an IWB into network and Internet activities provides another mode of learning. The learning activities become highly interactive when using an IWB with software such as Google Earth. Students become part of the world they are exploring.

Efficient in content delivery

Using IWBs will often provide teachers with the opportunity to cover more content and provide more learning activities to students.

Introduction of complex concepts

It is often easier for students to develop an understanding of complex concepts when an IWB is used. The interaction, movement and opportunity to provide information in a variety of media provides a learning environment that assists in the presentation and learning of complex or abstract concepts.

Increased ICT access when resources are limited

In many classrooms, the availability of computers is limited. Students need to wait their turn to use the computer. In group work where ICTs are being used, it is difficult for students to be involved with the technology.

The IWB allows students to work in groups and access the software and computer functions at a group or individual level. They do not have to wait for a computer to be available or have to move in

order to input to the computer. Each student in the group can interact with the computer through the IWB.

Increased critical thinking skills

The use of the IWB increases the opportunity to use critical thinking. This is possible by the size and interactivity with the system. The IWB becomes a “mind tool” to support analysis, critical thinking and the development of abstract understanding.

A change in attitude

Many studies that have focused on the use of IWBs within the classroom have noted a marked change in the attitudes of students towards learning and class interaction. Student attitude towards learning activities improves and students are more likely to become involved in the learning activities where IWBs are used. Students clearly enjoy using the IWB which has a positive impact on their interaction with the curriculum and learning.

Using Interactive Whiteboards with Students with Special Needs

While the IWB has potential to engage and increase the learning opportunities for all students, it has even greater potential for learning support for students with special needs.

Alternative access

Direct access does not require mouse coordination

Many students have conceptual difficulties when it comes to using a mouse. The notation that they must move and click the button on a remote device in order to select an object on the computer screen is a difficult concept for some students to understand.

The access to an IWB is a more concrete concept than that associated with other pointing devices such as a mouse. If you want something to happen on the whiteboard, you simply press it. Using an IWB enables students to interact and focus on the learning concepts, rather than the conceptual and physical processes involved with accessing the computer.

Allows gross motor interaction

Many students are unable to use a regular keyboard or mouse because they have limited fine motor skills that are needed to manipulate these devices. A large target area on an IWB will allow

Vision Impairment

The large display that is possible with an IWB enables students with low vision to target areas of the computer screen more easily and to assist with interaction with software in group situations.

Writing Recognition software can replace handwritten text with editable text that can be recognised by screen reading software such as that used by blind students.

Hearing Impairment

It is often difficult for students with a hearing impairment to be able to take notes from the whiteboard and focus on the teacher's speech, lip read, or watch an interpreter. Using an IWB enables the student to focus on the teacher's speech or interpreter's signing. They are then able to review the notes that have been recorded from the whiteboard at a later time.

Learning Difficulties and Learning Disabilities

Interactive Multiliteracy

With an IWB, students are not only provided information through multiliteracy, they also have the opportunity to interact with this multiliteracy. This interaction with sounds, images, animation, movies and text provides a highly sensory learning environment that the student can immerse themselves into. This environment will develop multiliteracy capabilities within the student. Students are more "in touch" with their learning environment and learning experiences.

Group interaction

The IWB provides an effective avenue for students to develop many of the skills required for group and social interaction. The group interaction can take place at the whiteboard, with students developing their ideas through the use of the IWB. It can also take place away from the IWB, using the information recorded from the IWB as a basis for their group interaction.

Note Taking

In a learning activity where information is being provided, teachers will write or draw on a whiteboard while verbally providing information. Both the information displayed on the whiteboard and provided verbally and visually by the teacher needs to be taken in by the student, encoded and made sense of. Students may need to write their own notes to assist with their understanding of the information being provided.

Many students have considerable difficulty carrying out the multiple tasks that may be required of them during this type of instruction. They may not be able to make connections between the visual information and the auditory information provided by the teacher. They may focus on duplicating the content of the whiteboard and not be taking in what the teacher is saying. If they focus on the teacher, the whiteboard information may be lost.

By using an IWB, students can focus more on the meaning and making their own notes. The information displayed on the whiteboard can be stored in the computer for later collection and inclusion with the student's notes.

Explicit Demonstrations

The IWB improves student understanding by the clarity of demonstrations able to be provided using the system, particularly in relation to ICTs. Students can clearly see the actions, computer functions to be undertaken and the outcomes without having to crowd around a single computer screen. The mouse movements and keystrokes can be seen by the students at the whiteboard, rather than having to explain these functions.

Attention Deficits

There have been a number of studies undertaken to identify the ability for IWBs to increase the learning opportunities for students that have attention deficits. Many of the students display a direct

correlation between the incorporation of IWBs into the learning strategies and the level of attention to learning tasks. The capacity for the IWB to collect and record information allows students to focus their attention on one task or set of data, rather than requiring multi-tasking from the student. The visual, interactive and challenging elements provided with an IWB system support the development of attention. As a result of the student's ability to focus and participate longer in activities, behaviour issues associated with attention deficit are reduced.

Increasing the Success of The Interactive Whiteboard

As with many new technologies, there is a real possibility of technology abandonment with IWBs – that is, the IWB does not become used once it has been purchased. There are many reasons why this may occur and it is important to ensure that strategies are put in place to maximize the use and educational impact of the system within the classroom.

Play and training

While many teachers who may be hesitant users of ICTs identify the actual setting up of ICTs as a major hurdle to their use, it is the use of the ICTs that teachers find confronting. Structured learning can often. Many teachers find it a valuable experience to simply play with the technologies. This is not wasted time, as it allows teachers to explore the technology with a helper standing by for questions and support. Other teachers do require

The Tool not the cure

As with any technology, it is important that effective strategies accompany the use of the IWB. Strategies and activities that focus on how the IWB could be incorporated into the learning will often ignore the strategies that are effective to support the learning of students. The IWB should be used where it enhances the identified learning strategies for the student. It should not be used to identify what or how the student will learn. There is still the necessity of multiple approaches to learning for reinforcement of learning concepts. Relying too heavily on one tool or strategy is limiting the experiences that students are exposed to.

Too much

For some students, the multiliteracy aspect of the IWB may in fact be too much. Some students with Autism or sensory reception difficulties may not be able to cope with the increase of information and interaction of the IWB.

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Interactive Whiteboard Web Sites

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