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Interactive Whiteboards as a Tool for Teaching Students with Autism Spectrum Disorders

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Abstract
This paper presents part of a research study on the affordances of digital technologies in the learning of students with Autism Spectrum Disorders (ASD) undertaken in the Faculty of Education, University of Wollongong. The study is framed around the understanding of modern digital technologies, and Interactive Whiteboards (IWBs) in particular, as cognitive tools for teaching and learning based on the theory of social and cultural mediation of children’s development and learning (Vygotsky, 1978; Engestrom, 2001). The view of the IWB as a teaching and learning tool is twofold: firstly, the IWB is analysed as a tool that can be used to enhance teachers’ pedagogical practices (within the teacher’s activity); and secondly, the IWBs are analysed as a tool which allows the teacher to meet specific needs of the students with ASD. This paper presents a pilot study into the use of IWBs in the day-to-day teaching of seven children with ASD (12-13 years of age), since the technology was introduced to the educational setting. The methods of data gathering included a series of classroom observations, audio recordings, collection of artefacts and semi-structured interviews with teachers and administration. Activity Theory (Engestrom, 2001) is used to explore the integration of IWBs in the classroom environment where the individual, classroom and whole school contexts are considered. The consideration of multi-layered contexts of IWB implementation allowed us to examine factors such as teacher’s pedagogy, teacher-student and peer interactions, the setting’s ICT policies, and teacher professional development and collaboration.

Introduction
In recent years, technologically enhanced education has become a priority in Australian schools, and special education is not an exception. The analysis of current literature demonstrates that the students with Autism Spectrum Disorders (ASD) eagerly engage in working with technology as the clear rule-based systems used by digital and visual technology make them highly suitable for such individuals. There is a significant body of research in the area of digital technologies and ASD, which recognises the effectiveness of a variety of newly emerged approaches, however, in most cases, this research represents predominantly clinical studies. There is limited research into the use of digital technology in relation to everyday pedagogical practices in applied classroom settings.

This paper reports on preliminary findings of a research project that investigates the ways that technologies have been used in authentic learning settings of children with ASD in an Australian classroom context. It examines the practical experiences of a teacher integrating new educational technologies, namely, the Interactive Whiteboard (the IWB), into
her existing practice in order to meet both curriculum, and the specific individual needs of her students. Socio-cultural approach and Activity Theory (Vygotsky, 1978; Engestrom, 2001) are used to explore the integration of IWBs in the classroom context at an individual, classroom and whole school organisational level. At the individual level of a teacher, the IWB is analysed as a teaching tool that can enhance (or hinder) the teacher’s pedagogical activity. At the classroom level, the IWB is seen as a tool to support learning activity, and to meet the special needs of the children with ASD. The consideration of whole school level of the IWB implementation allowed us to examine factors such as school ICT policies, teacher professional development and collaboration.

Technology support in teaching and learning of children with ASD.

Characteristics of ASD are identified by a triad of impairments (Wing, 1996) encompassing social-communication skills and behaviours. Broad characteristics include limited or impaired use of verbal and non-verbal cues; difficulties with social interactions and cues including a lack of appropriate responsiveness to people and an inflexibility and rigidity in thought, behaviour and language patterns (Wert & Neisworth, 2003). In addition, in childhood and within a classroom context, the ability to understand symbolism linked to play and imagination, is identified as a significant contributor to social difficulties (Jordan, 1999; 2003) alongside the physical and emotional discomfort associated with human interaction and proximity (Zihni & Zihni, 1995) involved in one on one and group teaching.

Research into the use and effectiveness of digital technologies in the education of students with ASD has become more prolific. The visual learning dimension of digital technologies is supportive of the visual modality of students with ASD and underpins research. Digital technologies are predictable, dependable and can be controlled in regard to stimuli and unpredictability (Jordan & Powell, 1995). The majority of research identifies clinical studies involving small numbers of students, with very few studies within the applied setting of a classroom. Examples of discrete trials focus on Computer Assisted Instruction in developing a range of literacy skills (Coleman-Martin, Heller, Cihak & Irvine, 2005; Luckevich, 2008; Massaro & Bosseler, 2006; Tuedor, 2006), Electronic Screen Media to teach, support and present social and communication skills and authentic situations (Sansosti & Powell-Smith, 2008), visual schedules for routines and activity completion (Mechling, Gast & Cronin, 2006; Kimball, Kinney, Taylor & Stromer, 2004), virtual reality (VR) environments for symbolic play skills (Herrara, Alcantud, Jordan, Blanquer, Labajo & De Pablo, 2008) and social skills (Moore, Cheng, McGrath & Powell, 2005). Kinney, Vedora, & Stromer (2003) claim that the majority of research to date has concentrated on the use of individualised computer programs and one on one implementation and teaching. These researchers acknowledge the difficulty teachers may have in employing similar individual programs in a classroom setting.

Carnahan, Basham, & Musti-Rao (2009) is one study which implemented a low technology intervention (interactive books with visual supports and music) in a classroom setting with a group of students with autism. However, based on variables which affected the teacher’s ability to ‘control’ intervention settings they resolved to remove the ‘human element’ such as the teacher, from the applied setting and segregated students to computer-centred, non-social environments.

Whilst the effectiveness of digital technologies as a teaching tool with students with ASD have been identified as beneficial due to their predictability, routine and systems-orientated capacity reliant on visual data, generalising such findings to the applied setting of the classroom may be problematic due to barriers that classroom teachers might face if applying these research findings to their teaching practice (Tanner, Dixon & Verenikina, 2010). It is also argued that students with ASD do not form a homogenous group and technology usage may need to be adjusted to suit individual learning needs. Therefore the study of the effectiveness of such technologies, based on these studies, is not sufficient, because of the inability to generalise results across the ASD population (Mineo, Ziegler, Gill, & Salkin, 2009; Jacobsen, Foxx, & Mulick, 2005; National Research Council, 2005).
Although research indicates digital technologies have the potential for supporting academic and social needs of individual students on the Autism Spectrum the teacher’s perspective is missing. Research is needed that addresses teacher needs and competency in their use with this cohort of students as well as their perception of the social validity of interventions within a classroom context.

**IWBs in teaching and learning**

The widespread proliferation of IWBs for enhancing classroom teaching and learning stimulated a significant body of research into the manner of their use and their effectiveness on the student’s attainment (Gray, Hagger-Vaughan, Pilkinson & Tomkins, 2010; Kuzminsky, 2008; Bennett & Lockyer, 2008; Zevenbergen & Lerman, 2007; Moss, Jewitt, Levačić et al., 2007).

Recently the IWB technology has rapidly become an essential component of a modern classroom worldwide (SMART, 2010; Lee & Gaffney, 2008). However, the research on the relationship between IWB installation and pupil performance levels is inconclusive. For example, the study of Moss and colleagues “failed to find any evidence that the increase in the installation of interactive whiteboards … in London schools has increased pupil performance in Key Stage tests” (Moss et al., 2007, p.72). Other studies highlight both advantages and difficulties in using IWBs, and emphasise the pedagogy of its use rather than the importance of the technology itself (Gray et al., 2010; Verenikina, Wrona, Jones & Kervin, 2010).

Research indicates that the use of IWBs in the classroom considerably increases student motivation and engagement in learning, particularly at the initial stages of the implementation (Higgins et al, 2007; Beauchamp & Parkinson, 2005). However, there was no evidence obtained to demonstrate the long-term effect.

Researchers differentiate between intrinsic learning motivation and motivation as directed at the technology (Beauchamp & Parkinson, 2005). It is suggested that the novel nature of IWB technology makes it initially attractive for students, however, if the intrinsic motivation to learn is not supported, the initial interest might wear out as the novelty fades away (Beauchamp & Parkinson, 2005; Robertson, 2008).

The study of Kuzminsky (2008) discussed the benefits of the IWB for visual and kinesthetic learners. She documented a case where a kindergarten teacher used the IWB (the Activboard and Activstudio software) to teach narrative by actively engaging students in ‘walking through’ their stories while they “moved a self-portrait paper doll through their created composition from week one. They verbally created and told the story of their character’s travel through the composition” (Kuzminsky, 2008, p.19).

One common theme that is identified throughout the studies of the IWB is that of interactivity. The literature addressing interactivity often focuses on how this feature can enhance students’ learning (Schuck & Kearney, 2007), however there is no consensus on what constitutes interactivity (Roussou, Oliver & Slater, 2008). Research of Moss and colleagues (2007) summarised the ways that the term interactivity is used. Firstly, it is ‘technical interactivity’, where the focus is on interacting with technological facilities of the board. Secondly, researchers talk about physical interactivity, such as ‘going up to the front’ and manipulating elements on the board. And finally, interactivity refers to social interactions between students in relation to their learning in the classroom (Moss et al., 2007). The latter is the most important from the pedagogical view based in Vygotskian approach to teaching and learning.

To conclude, the important themes that are arising from the study of IWBs and their effects on learning and teaching are those of learning engagement, visual support, and interactivity which all are highly applicable to the teaching and learning of the students with ASD. Nevertheless, there is very still limited research in the affordances of IWB in special education settings in general, and in relation to the students with ASD in particular.
The Study

Approach and methodology

The theoretical framework of the study is based on the view of children’s learning and development as a socially and culturally mediated process (Vygotsky, 1978). The socio-cultural theory is seen as “a useful framework for research on special needs education” which enables the researchers “to describe the complexity and the recursiveness of the social reality under study” (Ghesquière & Van der Aalsvoort, 2009, p.217). Socio-cultural approach and Activity Theory (Vygotsky, 1978; Engestrom, 2001) will be used in this study to explore the integration of digital technologies in the classroom context at an individual, classroom and whole organisation level. Within this approach the digital technologies (the IWB in this study) are seen as educational tools (Jonassen, 2000) that can enhance teacher’s pedagogical goals (as depicted in Figure 1, adapted from Engestrom, 2001).

![Figure 1: Activity system of teaching children with ASD using the IWB](image)

The focus of the study was the teacher’s activity system where the IWB is considered as a pedagogical tool that is used by the subject (teacher) to achieve the goal of the activity (the object), i.e. effective teaching children with ASD. The teacher purposefully uses IWB technology as a tool to achieve his or her pedagogical goal and to incorporate the IWB into the activity in a pedagogically sound manner. The teacher operates within a community, in this research this refers to the wider school community, and includes the students in the classrooms, other teachers in the school, IT and administration support and school leaders. The rules refer to the ways that technologies are used by the teacher in relation to the policies and regulations in the school, the special education setting and in the field of special education on the whole. The social reality of technology use is captured by the notion of division of labour, such as the division of power between the subject (teacher) and the community (eg students in the classroom).

The students were not the main focus of the study but it was essential to observe the children’s engagement in the use of the IBW in order to analyse its potential affordances. The activity system of a student as a subject of his or her own learning activity is represented in Figure 2. It illustrates how the IWB as a tool can fit in and support children’s learning activity.
The aims and research questions

The aim of this study was to understand the affordances and limitations of the use of interactive whiteboards in teaching children with ASD. In particular, we aimed to explore the affordance of the use of IWBs in providing visual support, and enhancing imagination, self-regulation and social interactions in children with ASD. These were considered in relation to the pedagogical ideas that might influence the use of the IWB in working with these children.

This research project moves beyond clinical-based research that has dominated this field, and looks at the day-to-day reality of how digital technologies are used in a classroom context with students who have ASD. The emphasis was on the teachers and their pedagogy rather than on their adherence to a strict methodology of intervention. If technology does not fit into teacher’s everyday classroom activity as a tool the teacher might disregard it in spite of knowing that it can be useful for students with ASD. It used a social cultural theoretical perspective to analyse the complexities of classroom contexts and the incorporation of digital technologies within day-to-day teaching and learning for students with ASD.

Background, participants and the setting

The overall study is being undertaken in three segregated settings in a large region in NSW that enrol children with ASD across a range of age groups. A qualified teacher and a full time teacher’s aide teach in each class. There was a variety in technological expertise among the teachers. This paper reports on the study of one of the three settings involving a class of seven students (6 males and 1 female, 12-13 years of age), one full-time teacher, Alice (pseudonyms are used), and one full-time teacher’s aide, Sam. The teacher was experienced in providing educational programs specifically for students with ASD. All the students in this class had been diagnosed with relatively high functioning autism and present with good verbal communication skills. The class is situated within a local government primary school but is under the auspices of a private service provider.

Supported by significant investment, the use of technology was at the forefront of the school priorities. Apart from IWB (Smartboard Software 10), the classrooms were equipped with laptops, desktop computers and a data projector. The teachers in this study received school-based professional development and were supported through a Technology Support Team that encouraged collegial sharing of ideas and teaching approaches among staff to support successful integration of the technologies into daily learning experiences for their students. The Technology Support Team also provided general ongoing technical support. There was a clear expectation that all teachers within this setting used available technologies regularly across all curriculum areas.
The methods of data collection.

As pointed out by Ghesquière, Maes, and Vandenberghe (2009, in Ghesquière, & Van der Aalsvoort, 2009), in special education, “the complexity of studying schools as a system requires qualitative case studies involving interviews, observations, and field participation” (p.217). The overall study was designed as qualitative research that included a number of case studies with one case reported in this paper. Three types of data collection were used: observations, a semi-structured interview with the teacher and collection of artefacts and visual evidence (photographs, video footage and students’ work samples).

The observations included a series of four 1-1.5-hour visits to the site and focused on how the teacher used the IWB in her classroom. The schedule of the observations was chosen by the teacher to ensure that the technology was used during the visits. The researcher took notes during the observation and wrote detailed field notes straight after each visit. The interview with the teacher was conducted after the observations were completed and was based around the innovative ways technologies were being used. Also considered was the teachers’ perceived effectiveness of the IWB and how it can be linked to identified individual student learning and behavioural needs. Additionally, the photographs, audio tapes and work samples of the use of digital technologies were collected to support the researcher in clearly identifying and recalling the manner in which the technologies were used, and to provide visual evidence of how teachers use them.

Findings and Discussion

The observations commenced shortly after a fixed, wall-mounted IWB was installed in Alice’s classroom. All the teachers attended a training session organised around the visit of an educational consultant from the IWB provider.

The four lessons scheduled for the observations, utilised the IWB for a variety of pedagogical activities. These included a number of routine activities such as day planning activities, reading news and finding the information about the weather on the Internet.

The main ongoing activity conducted across all the four weeks of observations was a Rainforest Project. It commenced on the first visit and was continuing during the last observation. Presented below are brief synopses of the use of the IWB during each visit, followed by a discussion of the advantages and limitations of its use in teaching and learning. During all the visits the teacher, Alice, the teacher’s aide Sam and all seven children were present (except one, when one of the boys was absent due to illness). The IWB was positioned at the front of the classroom with four children’s desks positioned facing it.

The Data Synopses

Observation 1 synopsis: Introduction of the Rainforest project

• The beginning of the Rainforest project. After the researcher and children were introduced, Alice announced the commencement of a Rainforest Project that required a number of in-class activities and home tasks. She started by brainstorming the word ‘rainforest’. The children were sitting at their desks. The IWB was used by Alice to visually support her discussion with the children.

• Technical difficulties. It was a bright day and the blinds had to be put down so the screen could be seen. The darkness of the room did not appear to bother the children. Alice wanted children to come to the screen one by one to write their word, however, children had difficulties writing and she ended up writing their words for them herself and asked the children to copy all the words from the IWB using paper and pencil. Due to the darkness it was difficult for the children to see what they were writing. Alice tried to open one blind but the IWB screen became practically invisible and she had to close it again.

• The use of the Internet. Then Alice logged into the Internet and found a map showing location of rainforests across the world. This allowed for a discussion of the characteristics of the geographical location of rainforests. Alice asked a child to come to the screen and circle some areas which he did but not without technical difficulties again.
Then the screen froze and children recommended she re-start the computer - which she did.

- **PowerPoint presentation.** Next Alice opened a PowerPoint presentation from the Internet; it was very informative and she was reading it to the children, however they had difficulties in keeping their attention focussed and subsequently they were asked to read it themselves at home.

**The use of the IWB in observation 1**

**Advantages**

- Children appeared to be highly engaged in the lesson; their attention was focussed on the IWB most of the time (except for the teacher’s reading of the PowerPoint slides). However, as discussed in the literature (Beauchamp & Parkinson, 2005), the point in question was whether the children’s attention was intrinsically focussed on the content at hand or was it mostly directed at the technology?
- Children were able to get up off their desks and walk to the IWB screen if there was no technical problem.

**Limitations**

- The room was dark and children had difficulties handwriting
- Technical problems did not allow for physical engagement with the IWB screen
- The operation of the IWB and the lesson was teacher-centred

**Observation 2 synopsis: A variety of activities**

- **Reflecting and planning.** Alice displayed text on the IWB screen (previously written on her computer) that indicated the type, sequence and completion of morning activities. It also included reference to the researcher’s visit.
- **Rainforest pictures.** Alice put a rainforest background on the screen. Each child was assigned an animal figure. Individually the children came to the IWB and moved their images to the rainforest from the bottom of the screen. The animals made noises while they were moving and all children responded with loud laughter.
- ‘**How does my engine run?**’ There were three options: fast (red area with a rabbit icon), OK (blue - human figure) and slow (green – turtle). Each child had to come to the screen and write their name on one of those options. Two children indicated that their engine was running fast and Alice asked them to go and choose an activity in an adjacent room to slow/calm down.
- **Further planning.** Alice opened a new window with a timetable indicating daily activities and a timeframe. Children were asked if they had any questions.
- ‘**Did you do your homework?**’ Alice opened another window on the IWB screen with a homework table indicating days and dates for due homework. Smiley or sad faces indicated whether they had completed and returned their homework. Alice stated it was Mother’s day so there was no homework so they didn’t need to fill it in. Alice drew the children’s attention to their records and some appeared unhappy when sad faces were indicated as being against their names.
- **Converting handwriting into print text.** While explaining the new homework, Alice was handwriting on the IWB screen. She wanted to print it out for children and needed to convert the handwriting into print. The handwriting would not convert easily and children responded with laughter. Alice asked each child to write their name on the IWB and then convert it. One child kept writing his name in a very artistic way and the computer could not convert it and the child was showing extreme verbal and gestural signs of frustration.
- **Smart Board fun time!** Some children wanted to keep going to develop their skill of writing on the IWB screen and Alice said that they could practice during “Smart Board fun time” – a time when they were allowed to freely explore the IWB.

**The use of the IWB in observation 2**

**Advantages**
• Children were highly engaged with the IWB in a variety of ways including responding to other people’s interactions.
• Some routine activities such as *How does my engine run? Did you do your homework?* and *Reflecting and planning* provide stimulating visual tools to support monitoring and regulating internal feelings and regular classroom routines, however the point in question is whether it is more effective using this technology than traditional methods of visual paper-based strategies for the same purpose.
• Children had a lot of fun while engaging in the IWB related activities however in this case the technology was rather the object of learning rather than the tool.

**Limitations**
• In the *Converting the handwriting* activity the children’s creativity was not supported due to the inability of the technology to convert the text. Frustration arising from the expectation of predictability of text could affect behavioural responses of children with ASD. In relation to the teacher’s activity the IWB did not serve as a tool to support a pedagogical goal, instead the tool affected the activity and substituted for its pedagogical goal. The teacher in this case became distracted from the original academic goal by the need to experiment with the tools and its output.

**Observation 3 synopsis: ‘My Rainforest Adventure’ picture**
• *Browsing for the news & How does my engine run?* At the beginning of the lesson children were sitting in a semi-circle in front of the IWB and were looking up the news and the weather on the Internet, and then did “The engine’ activity which has become a routine morning activity for them (according to the teacher).
• *Rainforest story plan.* Alice asked children to write a story plan using paper and pencils. She used the IWB to model an extended plan of how to write a story (narrative).
• *Rainforest picture.* Alice asked children to draw their pictures of rainforest on the IWB and showed them an example of what her daughter did on her computer at home (it was done in *Notebook Software Gallery Collections*). The teacher asked children one at a time to come to the IWB screen to create a picture based on a provided rainforest background, while the rest of the class was engaged in story writing.
• *Individual scaffolding.* The teacher was walking around the class helping children with their story, however she kept an eye on the child at the IWB and was able to provide the child with support ‘just in time’ when he or she had difficulties with operating the IWB software or having problems with picture choices. She provided the children with hints by questioning, ‘Did you find any animals?’ Other children did not overtly appear to be engaged or watching the child at the IWB, but it was obvious that they kept an eye on what was going on. For example, when C. a 12 y.o. girl, did her rainforest picture and blew the figure of the tiger out of proportion by making him really huge, all the children focussed their attention and appeared mesmerised saying “Wow” (figure 3). She also drew a cage over it to protect others from such a monster!
• *Creativity.* Most of the children were really creative at the IWB when making their pictures. They carefully selected pictures and experimented changing the size of the animals, birds and insects! Their verbal responses indicated enjoyment.
Figure 3. C. blew the figure of the tiger out of proportion and drew a cage over it

The use of the IWB in observation 3
Advantages
• The IWB provides numerous opportunities for children in creating their pictures. Doing their own pictures at the IWB with scaffolding from the teacher appears to be a very useful learning activity that supports creativity and imagination. It provides a large number of choice and enables manipulation of the images in a dynamic and creative manner.
• It also allows children to create a picture in a hands-on manner. For example, C. chose a very large number of animals and insects for her picture but then deleted about 90% of them thus making her choices in a hands-on manner.
• The activity of creating your own picture for the project allowed for the use of the IWB as a tool for learning activity oriented towards its object such as the Project completion.

Observation 4 synopsis: ‘My Rainforest Adventure’ story
• Moving schools. The last week Alice’s class had to move to another school due to unexpected discovery of a fault in the construction of the school building. According to the teacher, it was very hard to work without an IWB for few days! When a portable IWB was delivered they could continue with their routine activities and the Rainforest project.
• Lost pictures. The main focus of the lesson was on writing a story to match the created picture. However, during the process of moving schools some pictures created by children were lost. Thus they had to do their pictures again!
• Difficulties with writing ‘My Rainforest Adventure’ story. Children had some difficulties in writing a sustained story and Alice had to get back to, and reinforce the structure of the story. She presented it in a more simple way than the week before, however the children still were having difficulties writing their stories. Alice had to explain again the difference between a real story and a fiction and asked children to engage the imagination. Then she, and Sam, the teacher’s aide, had to individually scaffold the children towards their story writing and using their imagination.
• Alice was working with Jn. on his story. Jn. tended to provide a list of facts about the rainforest instead of writing a story with the beginning, middle and the ending.
• Sam was working with Z. on his story and the child did not seem to be able to think of a story and looked disengaged when Sam asked him to think of a fiction story. While Sam tried to insist that Z. make a story, the child was getting frustrated. Meanwhile the child who worked at the IWB just finished her picture and was reading out loud her story to Alice. Sam suggested Z goes to the IWB to make his picture. Z. went to the IWB, calmed down and started to choose his pictures. Alice asked him to match his picture with his story, however Z. did not have (or did not remember) his story and he started to make the story up while he was doing the picture. He created quite a sophisticated story including various animals and drew a fence and many people! (Figure 4)
Alice scaffolded his work further by moving the monkey in his picture on the fence close to people. This prompted a strong response from Z to this interaction and as a result he readjusted his story. One of the other children who were observing Z’s progress commented, “You created a decent story!” Alice wrote the story down for Z. as he verbalised it as they were working at the IWB together! Z. claimed “It is just a small story but I’ll go with that”. Alison, Sam and the children applauded Z. on creating such an interesting story.

The use of the IWB in observation 4

- Supporting imaginative story writing. For Z the teacher stated that using the whiteboard stimulated and supported his imagination. The use of large visuals to model the narrative structure and demonstrate the creation of a story through animated visual stimuli engaged the children. It also provided opportunities for a shared creation supported by the teacher through scaffolding. Using the large screen increased other student involvement in their responses to their peers. Children with ASD have been identified in the research as “exhibiting a deficit in narrative comprehension which adversely impacts upon their social world” (Davis, Dautenhahn, Nehanix & Powell, 2007). In this instance the use of the IWB has been used as a tool to support construction and imagination but also to experiment with narrative features in a pictorial rather than written format. This resonates with the research by Kuzminsky (2008) who identified the benefits of the IWB for all children who may be visual and kinesthetic learners not just specifically those with ASD.

Conclusion and future research

The study of affordances of digital technologies as teaching and learning tools (Jonassen, 2000) in supporting the learning of students with ASD is a newly developing area (Sansosti, & Powell-Smith, 2008). The Interactive Whiteboard in particular is one such tool that provides children with ASD opportunities to learn in a format that supports their visual modality. It is evidenced in this single case study that a range of advantages and disadvantages exist in a classroom context. Whilst the tool stimulates engagement it does not always reflect pedagogical goals as determined by the teacher. Whilst the teacher can provide a controlled and predictable visual format for students to manipulate and master, the tool itself can also be distracting due to the desire or need to experiment with alternate methods if the original focus does not work or is not effective.

Whilst the engagement of the students reflected individual and group enjoyment using the IWB as a learning tool in this case there were times when the technology was the object of learning rather than the learning tool. Whiles this might be a positive thing as the learning that takes place in developing IT skills is important in the current age, the proper scope and sequence of skills need to be carefully chosen rather than introduced in an haphazard manner.

It needs to be indicated that the technology was relatively new to the teacher and she was still learning and experimenting with its possibilities. New tools need time for exploration by both the teacher and the students. “Technology, of all types, is forcing educators to evaluate the way they do things and aggressively explore new models of teaching and learning” (Ray, 2007, p.18, in Kuzminsky, 2008, p.1). However this needs to be done within the context of learners, their individual needs and individual classrooms as well as being reflective of the purpose of the activity.

This paper presents the exploratory results from one case study from a larger research project. The interesting findings particularly those relating to affordances of imagination and narrative will be expanded through the analysis and comparison of results from all four individual cases. This research will be extended to more sites throughout New South Wales in the future, with a greater range of students with ASD from high to low functioning and a greater number of teachers with a variety of technological expertise.
References


