Author Name: Carol Le Lant
Contact Email: carol.lelant@flinders.edu.au

Interactive Whiteboards, students with intellectual disability and oral language production

Carol Le Lant
Flinders University of South Australia

The focus of this research was to examine the impact of the use of interactive whiteboards (IWB) on the engagement of students with intellectual disability in early reading lessons. Case studies of five students with intellectual disability were carried out using an alternating treatments design. Detailed coding of video recordings of lessons was carried out at 30-second intervals across 10 lessons in each of the IWB and traditional desk-top lessons. All students acquired knowledge in the aspect of reading taught. Upon analysis of the levels of engagement, no consistent pattern of difference was observed between the lessons using an IWB and those taught using a more traditional desk-top style delivery. However, the extent of oral language production during lessons did differ between the two conditions, with there being evidence of a higher level of relevant verbal elaborations in the lessons taught away from the IWBs. This result is important as production of language, particularly elaborated or connected language, helps to build knowledge networks and deepen understanding of the task and therefore comprehension. The elaborated language in the non-IWB lessons was found to be up to twice that of the IWB lessons.

There have been many and varied claims of the benefits of incorporating the interactive whiteboard (IWB) into classroom teaching practice. The aim of this paper is not to argue the benefits of IWB use, but to highlight a particular challenge when using IWBs when teaching students with intellectual disability.

The literature associated with the use of IWBs often contains a set of general claims about the advantages of IWB use such as the IWB providing opportunities for students to physically interact with, and control the display or its similarity to the multimedia, multi-sensory, multifaceted style the students experience with their computer games and television, thereby providing a link to what the students know and enjoy doing (Slay, Sieborger, & Hodgkinson-Williams, 2008; Tanner & Jones, 2007). The multimedia, multisensory features of IWBs are claimed to enhance students' memory (Smith, Higgins, Wall, & Miller, 2005) as the board can accommodate auditory, visual and kinaesthetic learning channels. It is these features that have the ability to *'intensify learners' participation in, and amplify the importance of, the activity'* (Jones, Kervin, & McIntosh, 2011, p. 58).

The IWB appears to have significant potential to provide an effective medium of instruction for students with intellectual disabilities (ID). The dynamic and graphical capabilities of the IWB have been predicted to offer substantial advantages for presentation of curriculum content in ways that students with ID can interact with. Students with ID generally have visual processing strengths and the IWB can provide a medium in which the information can be paired both visually and verbally which may lead to increased understanding (Whitby, Leininger, & Grillo, 2012). The visual supports help to develop students' receptive language capabilities (Pennington, 2010) by providing concrete visual examples of abstract concepts and allowing the consistent representation of an activity or model, allowing for much needed repetition (Goldsmith & LeBlanc, 2004). Further to this, the ability to mix visual and aural information is argued to facilitate the learning process, enabling learners to make connections between what they see and hear, enhancing student recall (Smith et al., 2005). However, there is need for caution when pairing images with words, as the pairing alone does not guarantee an improvement in learning outcomes (Sakar & Ercetin, 2005). The students should be required to actively pair images with words (Fossett & Mirenda, 2006) and perform exercises such as word building, cloze and rebus tasks to promote cognitive engagement.

Importantly, using an IWB during lessons has been perceived to motivate and engage students in the learning process. This impact on student engagement is seen to arise from factors such as the IWB

Author Name: Carol Le Lant
Contact Email: carol.lelant@flinders.edu.au

being easily visible to all students (Cogill, 2003), and its ability to provide colourful, and (at times) animated displays (Tanner & Jones, 2007). Some reports have found that students' attention spans, when using the IWB, often exceed that of what would be normally anticipated, particularly with very young students, deaf students (Carter, 2002), and those who can't read (Slay et al., 2008). Technology holds the promise of addressing attention issues with students with ID (Whitby et al., 2012) as students may experience sustained attention due to the multimodal features that direct their attention to the relevant features of a lesson (Goldsmith & LeBlanc, 2004).

Claims have been made about the impact of IWB use on student interaction within lessons. The BECTA (2003) report suggested that '*motivation is a key benefit of whiteboards. Reasons for this include their presentation capabilities and the high level of interaction that students enjoy [*through*] interacting physically with the board, manipulating images'* (p. 3). This report also suggested that having a student-work focus can lead to increased self-esteem and enjoyment. Changes in the level of engagement behaviours of students were identified in some reports, where more and relevant questions were being asked; and longer, more detailed responses were being provided by students (Higgins, 2010), there was increased verbal and physical participation (Gillen, Littleton, Twiner, Staarman, & Mercer, 2008), and students attention was gained which '*helped to increase their concentration and also motivational levels'* (Cutrim Schmid, 2008, p. 1559).

Very little research on the use of IWBs has been conducted involving students with ID (Yakubova & Taber-Doughty, 2013). However, some of the research reports have identified some potential advantages and pitfalls that can arise when using an IWB that would be applicable to students with ID.

In general, the predicted advantages of using an IWB with students with ID include the hands-on interaction with the software, the provision of conceptual links in the development and understanding of more abstract and complex ideas (Learning Development Centre, 2008). Further to this, Egerton, Cook and Stambolis (2009) state "*the IWB does afford students without strong verbal or literacy skills the ability to learn through non-verbal means through the presentation and manipulation of pictorial images, and similarly the opportunity to participate and to demonstrate their skills and knowledge" (*p.14). It is also argued that the 'experience' students encounter due to the highly visual format often resemble that of a movie and is helpful because this format is one to which many students with special needs particularly relate while supporting the development of attention (Learning Development Centre, 2008; Martin, 2007).

Problem areas that have been identified with the increased use of the IWB and consequential whole-class teaching approaches include the reduction in access to a differentiated curriculum to which students with special needs are entitled (Martin, 2007). This problem is also supported by Somekh et al., (2007) stating "*While SEN pupils are enthusiastic about the board, it may not necessarily be assisting their learning"* (p. 79). Teachers have a responsibility to ensure intellectual involvement is actively integrated into lessons involving new technologies such as the IWB. Planning lessons that promote cognitive engagement, encourage students to explore and construct knowledge about curriculum concepts (Jones et al., 2011).

Furthermore, the over-integration of the technical features of the IWB can cause teachers and students to lose focus of the objective of the lesson (Cogill, 2003; Sakar & Ercetin, 2005). Cutrim Schmid (2008) identified in her research that she sometimes "*tended to use hyperlinks more as an instrument of power than as a way of encouraging learners' active participation"* (p. 1564) which does not support the active integration of student knowledge into the learning objectives of the lesson, undermining the opportunity to construct meaning knowledge (ibid.).

Too much extraneous information can be included in IWB presentations (Cutrim Schmid, 2008; Tanner & Jones, 2007; Wall, Higgins, & Smith, 2005) leading to cognitive overload and students being unable to discern between what is important to the learning task and what is not (Sweller, 2005). When students are faced with this situation they can become frustrated and disengaged from the learning activities, resulting in their own performance suffering due to the negative affect cognitive overload can induce (Kalyuga, 2011). In addition to this, sensory overload has been reported when teaching students with Autism Spectrum Disorder, and students with Attention Deficit Disorder/Attention Deficit Hyperactivity Disorder have been observed as becoming over excited when the visual and sound features of the IWB are over used (Learning Development Centre, 2008).

Author Name: Carol Le Lant
Contact Email: carol.lelant@flinders.edu.au

The students who participated in this research project had mild to moderate intellectual disability and displayed significant attentional and memory problems combined with language difficulties or disorders. These students were identified by their classroom teacher because of their limited reading decoding skills. It was necessary to use strategies that helped the students to attend and maintain their attention to the task, as well as explicit instruction. This research supported the need to provide learning opportunities that were related to the student's own experiences and knowledge, and the need to give both visual and aural inputs. Therefore, the lessons incorporated a multisensory approach and multimedia as this approach had been shown to help students with learning disabilities assimilate and remember particular units such grapheme-phoneme correspondences and sight words, possibly because the incorporation of sound, vision and movement help to draw attention to the learning task (Westwood, 2007).

Engagement and IWBs

As touched on above, IWBs are argued to have a significant impact on classroom outcomes, particularly with the teacher embedding ICT into the curriculum. Engagement and motivation data arisen from research concerning IWB use has been predominantly from the perspectives of students and teachers and has been positive (Higgins et al., 2005). There has been a reported increase in the interactivity between students and content, which has been associated with more open questions, longer discussions and more general classroom talk (Higgins, 2010) resulting in greater cognitive involvement in learning (Somekh et al., 2007). This reported increase in the interactivity of lessons, and in particular the increase in open questions, longer discussions and more general classroom talk became of particular interest during the analysis stage of this current study.

Student engagement was the primary focus of this study as the perceived positive outcomes on student engagement should lead to positive academic outcomes because when students are affectively, cognitively and behaviourally engaged in school and learning they are more likely to experience success (Finn & Zimmer, 2012; Fredericks, Blumenfeld, Friedel, & Paris, 2003).

At the time the research was undertaken, there was little detailed empirical research on the benefits of the use of IWBs in the area of students under eight years of age (Burnett, 2010) or involving students with ID. Smith et al., (2005) identified the need to undertake research to fully understand the impact of IWB technology on teaching practice and student learning as they could not find any experimental research to review. Most of the research evidence on IWBs has been derived from student attainment data in national tests, interviews, surveys and questionnaires relating to teachers' and students' perceptions. The tentative nature of this research is well represented in the evaluation report by Somekh et al., (2007) which used language such as positive gains are *likely* to be achieved by all attainment groups, *may* lead to a widening gap in attainment for low achieving students, and *appears* to have relatively little impact on raising the attainment of students with special educational needs.

If these perceived positive outcomes on student engagement were realised then IWB use should lead to positive academic outcomes. When students are affectively, cognitively and behaviourally engaged in school and learning they are more likely to experience success (Finn & Zimmer, 2012; Fredericks et al., 2003).

Further to this, when the challenges identified in both the mainstream literature in using the IWBs and the literature on students with special educational needs are taken into consideration during lesson planning, positive learning outcomes should be experienced by the students who participated in this research project.

In summary, there have been many self-report studies, and studies of the perceptions on the effects IWB have on engagement gathered from teachers and students. However, to date, these predicted effects have not been documented in research that has observed the actual effects of IWB use on levels of student engagement on students with special educational needs.

Therefore, the research from which the current case studies were taken endeavoured to answer the question of whether the use of IWBs resulted in higher levels of levels of student engagement than traditional desk-top (non-IWB) teaching when teaching of reading involving students with special educational needs below 9 years of age. A new student engagement rating scale was developed that

Author Name: Carol Le Lant
Contact Email: carol.lelant@flinders.edu.au

provided an expanded view of observable student engagement behaviours in the areas of task, affective and cognitive engagement.

Briefly, five students aged between 6 and 9 years, identified with Global Developmental Delay, four of whom also had Severe Language Delay participated in a series of lessons explicitly teaching an aspect of reading as identified as requiring attention form the pre-test data. Four of the students were involved with learning the sounding and blending strategy, while the fifth undertook explicit instruction in grapho-phonic knowledge. Ten of the lessons were taught using the IWB and ten taught without the IWB (non-IWB), with the content of the lessons being held as comparable as possible (Le Lant, 2015). The case studies were implemented using an alternating treatment design, whereby the lessons were randomly alternated to enable the two conditions to run concurrently and allowing the effects of the two interventions to be compared (Wolery, Gast & Hammond, 2010). The lessons were video recorded and the students' levels of task, affective and cognitive engagement was coded using the Student Engagement Rating scale specifically created for this research (see Le Lant, 2015) using a 30 second partial interval sampling interval.

Discussion

Over the course of the intervention, the five students did acquire knowledge in the aspect of sounding and blending or grapho-phoneme correspondence using an interactive approach both on and off the IWB.

The main focus of the intervention was to observe differences in student engagement across the two conditions, and there were no consistent differences in task, affective or cognitive engagement across the two conditions that was apparent for the five students. Where differences were observed they did not consistently favour one condition. Further to the original research questions, when coding the video footage for engagement levels, it became evident there was a difference in language production between the two conditions which demanded further inspection as to the volume and type of speech being produced.

Speech was coded as relevant and in direct response to the task or question posed, irrelevant to the task or question and spontaneous relevant elaborations on the task or question posed. Irrelevant and relevant elaborated language then became the focus of discussion.

All of the students produced nearly twice as much elaborated relevant and irrelevant language during the non-IWB condition than when interacting with the IWB. This result has a practical implication for teachers of reading: Teachers want students to make connections between what they are reading and their existing knowledge, because such elaborations and connections have the potential to support increased comprehension and understanding, primary goals of any reading program. Hay et al., (2007) confirm this observation when they stated that students with low expressive and receptive language skills, like the students in this research, need increased exposure to language and more occasions in which to practice using language when engaging with texts. We also know the size of students' speaking and listening vocabularies, particularly those to which they have attached meaning, is strongly related to how well they understand what they read (Williams, 2012).

Further to these reading goals, this outcome regarding elaborated language is significant as many students with ID also have severe language delay and any attempts at communicating are to be encouraged. The on-task talk, and particularly the talk that involves elaborating and connecting current learning to prior knowledge, helps to embed and build knowledge. This talk also provides opportunities for the teacher to promote further connections to knowledge, providing further opportunities for students to develop an understanding of the content presented to transfer to other situations. As Alexander (2012, p. 2) stated *"… talk is essential to children's thinking and learning, and to their productive engagement in classroom life, especially in the early and primary years".*

There has been a growing focus within the South Australian Department for Education and Child Development on the importance of encouraging student talk in the learning process – the '*Chatter Matters*' Early Years Literacy project (Department for Education and Child Development, 2012). This renewed focus reflects international research on oral language development (for example Alexander, 2012; Konza, 2011; Warwick, Mercer, & Kershner, 2013). In this project when students were interacting with the IWB there was very little 'chatter'. Students whose oral language skills are not well developed are less able to use talk strategies for either minor or major problem-solving tasks

Author Name: Carol Le Lant
Contact Email: carol.lelant@flinders.edu.au

(Konza, 2011). Through interacting with others who are more articulate, whether it is the teacher, other students or family, students become more actively involved in constructing their understanding of print and language and the connections between the two (Erickson, Koppenhaver, & Yoder, 1994). Cognitive engagement is increased when students verbally share their interests and raise questions (Redmond & Vincent, 2015) with the material or ideas presented to them. This type of engagement is necessary as it does involve more than enthusiasm for learning (Somekh et al., 2007), rather it identifies a connection and cognitive engagement with learning.

Due to more IWBs being installed in classrooms around the world (Warwick et al., 2013) the question '*How to improve students' oral participation when using the IWB?*' becomes increasingly important, particularly for students with speech and language issues. The results of this research project support the research of Warwick, Mercer and Kershner (2013) which focused on explicitly teaching and establishing talk rules to encourage verbal interactions amongst students whilst engaged with the IWB and providing scaffolding to further support this key idea. The students in this project would benefit greatly from an explicit program designed around encouraging greater verbal participation when working with the IWB. Alexander (2012) specifically mentioned the need to develop and use oral language to assist in the development of phonological awareness and to advance the development of general language capabilities of students, enhancing the explicit link between early oral language skills and the students developing decoding skills.

Implications for the teaching of reading to students with Intellectual Disability and lesson design

Within the lesson planning phase, attention should be paid to the teaching and production of oral language to help students develop an oral vocabulary which could then be used to develop phonological skills which would lead to greater reading decoding and comprehension abilities (Fielding-Barnsley & Hay, 2012). Furthermore, the teacher would need to consider how to encourage relevant elaborative talk; whereby the ideas being taught are discussed and integrated with the students' experiences and existing knowledge (Hay, Fielding-Barnsley, & Taylor, 2010). Explicit teaching of cognitive strategies such as goal setting, making a plan, checking on progress, 'thinking aloud' and 'self-talk' (Westwood, 2007) would assist the students in monitoring their understanding of concepts while helping to stimulate relevant elaborations and allow the teacher to monitor the students understanding and progress. The development of these strategies would lead to students becoming more independent in their reading behaviours, which should, in turn, lead to the students being able to offer more opinions, make more predictions and read more independently, thereby increasing their capabilities across the general curriculum.

The importance of explicitly teaching cognitive strategies to younger students, and in particular students with intellectual disability is based on the need to equip students with the ability to eventually self-monitor their responses by applying a learnt strategy to a problem, and ultimately generalising the learnt strategy to other situations, tasks or settings. By explicitly modelling and guiding cognitive strategies, tasks that draw upon student's experiences and interests, cognitive engagement elements such as verbal elaborations can be taught to enhance learning, to ultimately help students select, recall, organise and understand the material before them.

The integration of technology into lessons should be with the focus of supporting identified learning goals (Ertmer & Ottenbreit-Leftwich, 2013), guiding the student towards making meaning of the task and constructing personal meaning with the content (Jonassen, 2013), thereby further developing the student's cognitive skills and strategies.

Future Research

The value of the findings that have emerged from this research points to the need to replicate this research and expand it to other students with different disabilities or to whole class settings. A focus on teachers explicitly teaching oral language and modelling the cognitive skill of the elaboration of ideas and connections to tasks combined with explicit reading instruction would lead to the development of oral language. The development of oral language would then help to build deeper connections with students' learning, in particular, improve their phonological awareness skills which would then positively impact on their ability to decode and comprehend text.

Author Name: Carol Le Lant
Contact Email: carol.lelant@flinders.edu.au

References

Alexander, R. J. (2012). *Improving oral and classroom talk in English schools: Acjievement and challenges*. Paper presented at the DfE seminar on Oracy, the National Curriculum and Educational Standards. http://www.primaryreview.org.uk/downloads_/news/2012/02/2012_02_20DfE_oracy_Alexander.pdf

BECTA. (2003). What the research says about interactive whiteboards. http://partners.becta.org.uk/upload-dir/downloads/page_documents/research/wtrs_whiteboards.pdf

Burnett, C. (2010). Technology and literacy in early childhood educational settings: A review of research. *Journal of Early Childhood Literacy, 10*(3), 247-270. doi: 10.1177/1468798410372154

Carter, A. (2002). Using interactive whiteboards with deaf children http://www.bgfl.org/bgfl/custom/resources_ftp/client_ftp/teacher/ict/whiteboards/index.htm

Cogill, J. (2003). The use of interactive whiteboards in the primary school: Effects on pedagogy *ICT in Schools Research and Evaluation Series*. Coventry: Becta.

Cutrim Schmid, E. (2008). Potential pedagogical benefits and drawbacks of multimedia use in the english language classroom equipped with interactive whiteboard technology. *Computers and Education, 51*, 1553-1568.

Department for Education and Child Development. (2012). Chatter Matters. Retrieved 5/5/14, from http:\\www.earlyyearsliteracy.sa.edu.au

Egerton, J., Cook, J., & Stambolis, C. (2009). *Developing a model of pedagogical best practice in the use of interactive whiteboards for children with autism and complex learning disabilities: Implications for initial teacher training*. Sunfield Research.

Erickson, K. A., Koppenhaver, D. A., & Yoder, D. E. (1994). Literacy and adults with developmental disabilities (pp. 39). Philadelphia, PA: National Center on Adult Literacy.

Ertmer, P. A., & Ottenbreit-Leftwich (Producer). (2013, 25/8/14). Removing obstacles to the pedagogical changes required by Jonassen's vision of authentic technology-enabled learning. *Computers and Education*. Retrieved from http://dx.doi.org/10.1016/j.compedu.2012.10.008

Fielding-Barnsley, R., & Hay, I. (2012). Comparative effectiveness of phonological awareness and oral language intervention for children with low emergent literacy skills. *Australian Journal of Language and Literacy, 35*(3), 271-286.

Finn, J. D., & Zimmer, K. S. (2012). Student Engagement: What is it? Why does it matter? In S. L. Christenson, A. L. Reschly, & C. Wylie (Eds.), *Handbook of Research on Student Engagement* (pp. 97-131). New York: Springer -Verlag New York Inc.

Fossett, B., & Mirenda, P. (2006). Sight word reading in children with developmental disabilities: A comparison of paired associate and picture-to-text matching instruction. *Research in Developmental Disabilities, 27*(4), 411-429. doi: 10.1016/j.ridd.2005.05.006

Fredericks, J. A., Blumenfeld, P. C., Friedel, J., & Paris, A. H. (2003, 12-13 March). *School engagement.* Paper presented at the Indicators of Positive Development Conference, Child Trends, Washington, DC.

Gillen, J., Littleton, K., Twiner, A., Staarman, J. K., & Mercer, N. (2008). Using the interactive whiteboard to resource continuity and support multimodal teaching in a primary science classroom. *Journal of Computer Assisted Learning, 24*, 348-358.

Goldsmith, R. R., & LeBlanc, L. A. (2004). Use of technology in interventions for children with autism. *Journal of Early and Intensive Behavior Intervention, 1*(2), 166-178.

Hay, I., Elias, G., Fielding-Barnsley, R., Homel, R., & Frieberg, K. (2007). Language delays, reading delays and learning difficulties: Interactive elements requiring multidimensional programming. *Journal of Learning Disabilities, 40*, 400-409.

Hay, I., Fielding-Barnsley, R., & Taylor, T. (2010). Facilitating young children's language and vocabulary development using a cognitive framework. *He Kupu e-Journal, 2*(3), 37-46. http://ecite.utas.edu.au/68040

Higgins, S. (2010). The impact of interactive whiteboards on classroom interaction and learning in primary schools in the UK. In M. Thomas & E. Cutrim Schmid (Eds.), *Interactive whiteboards for education : theory, research and practice.* (pp. 86-101). Hershey, PA: ICI Global.

Higgins, S., Falzon, C., Hall, I., Moseley, D., Smith, F., Smith, H. J., & Wall, K. (2005). Embedding ICT in the literacy and numeracy strategies.: University of Newcastle.

Author Name: Carol Le Lant
Contact Email: carol.lelant@flinders.edu.au

Jonassen, D. H. (2013). Transforming learning with technology: Beyond modernism and post-modernism, or whoever controls the techology creates the reality. In M. P. Clough, J. K. Olson, & D. S. Niederhauser (Eds.), *The nature of technology: Implications for learning and teaching* (pp. 101-110). Rotterdam: Sense Publishers.

Jones, R., Kervin, L., & McIntosh, S. (2011). The interactive whiteboard: Tool and/or agent of semiotic mediation. *Australian Journal of Language and Literacy, 34*(1), 38-60.

Kalyuga, S. (2011). *Cognitive load theory: Implications for affective computing.* Paper presented at the Twenty fourth International Florida Artificial Intelligence Research Society, Florida.

Konza, D. (2011). Research into practice: Oral language. (1.1). http://www.decd.sa.gov.au/literacy/files/links/link_157529.pdf

Le Lant, C. (2015). *The effect of interactive whiteboard use on the engagement of students with intellectual disability in early reading lessons.* (PhD), Flinders University.

Learning Development Centre. (2008). *Interactive whiteboards for students with special needs*. Retrieved from www.learningplace.com.au/en/dssulc/ldcictswd.

Martin, S. (2007). Interactive whiteboards and talking books: A new approach to teaching children to write? *Literacy, 41*(1), 26-34.

Pennington, R. C. (2010). Computer-assisted instruction for teaching academic skills to students with autism spectrum disorders: A review of literature. *Focus on Autism and Other Developmental Disabilities, 25*(4), 239-248. doi: 10.1177/1088357610378291

Redmond, C., & Vincent, J. T. (2015). Shared cognition facilitated by teacher use of interactive whiteboard technologies *Interactive Technology and Smart Education* (Vol. 12, pp. 74-89).

Sakar, A., & Ercetin, G. (2005). Effectiveness of hypermedia annotations for foreign language reading. *Journal of Computer Assisted Learning, 21*, 28-38.

Slay, H., Sieborger, I., & Hodgkinson-Williams, C. (2008). Interactive whiteboards: Real beauty or just "lipstick"? *Computers and Education, 51*, 1321-1341.

Smith, H. J., Higgins, S., Wall, K., & Miller, J. (2005). Interactive whiteboards: boon or bandwagon? A critical review of the literature. *Journal of Computer Assisted Learning, 21*(2), 91-101. doi: doi:10.1111/j.1365-2729.2005.00117.x

Somekh, B., Haldane, M., Jones, K., Lewin, C., Steadman, S., Scrimshaw, P., . . . Woodrow, D. (2007). Evaluation of the primary schools Whiteboard Expansion Project (pp. 1-237): BECTA.

Sweller, J. (2005). Implications of cognitive load theory for multimedia learning. In R. E. Mayer (Ed.), *The Cambridge handbook of multimedia learning* (pp. 19-30). Cambridge: Cambridge University Press.

Tanner, H., & Jones, S. (2007). Learning from children about their learning with and without ICT using video-stimulated reflective dialogue. In J. Watson & K. Beswick (Eds.), *Proceedings of the 30th Annual Conference of the Mathematics Education Research Group of Australasia* (Vol. 2, pp. 708-716). Melbourne: MERGA Inc.

Wall, K., Higgins, S., & Smith, H. (2005). 'The visual helps me understand the complicated things': pupil views of teaching and learning with interactive whiteboards. *British Journal of Educational Technology, 36*(5), 851-867. doi: 10.1111/j.1467-8535.2005.00508.x

Warwick, P., Mercer, N., & Kershner, R. (2013). Wait, let's just think about this: Using the interactive whiteboard and talk rules to scaffold learning for co-regulation in collaborative science activities. *Learning, Culture and Social Interaction, 2*(1), 42-51.

Westwood, P. (2007). *Commonsense methods for children with special educational needs* (5th ed.). London: Routledge.

Whitby, P. J. S., Leininger, M. L., & Grillo, K. (2012). Tips for using interactive whiteboards to increase participation of students with disabilities. *Teaching Exceptional Children, 44*(6), 50-57.

Williams, C. (2012). Promoting vocabulary learning in young children who are d/deaf and hard of hearing: translating research into practice. *American Annals of the Deaf, 156*(5), 501-508.

Yakubova, G., & Taber-Doughty, T. (2013). Brief report: Learning via the electronic interactive whiteboard for two students with autism and a student with moderate intellectual disability. *Journal of Autism and Developmental Disorders, 43*, 1465-1472. doi: 10.1007/s10803-012-1682-x