

## Technology Integration: Exploring Interactive Whiteboards as Dialogic Spaces in the Foundation Phase Classroom

**Chamelle R. De Silva**

*Tel: 021-7134490. P.O. Box 44982, Claremont 7735, Cape Town, South Africa.  
Chamelledesilva@gmail.com (CPUT)*

**Agnes Chigona**

*Faculty of Education and Social Sciences, Cape Peninsula University of Technology, PO Box 652, Cape Town, 8000. Tel: 021-6801689  
ChigonaA@cput.ac.za*

**Stanley A. Adendorff**

*Faculty of Education and Social Sciences, Cape Peninsula University of Technology, PO Box 652, Cape Town, 8000. Tel: 021-6801527.  
AdendorffS@cput.ac.za*

### ABSTRACT

Among its many affordances, the interactive whiteboard (IWB) as a digital space for children's dialogic engagement in the Foundation Phase classroom remains largely under-exploited. This paper emanates from a study which was undertaken in an attempt to understand how teachers acquire knowledge of emerging technologies and how this shapes their classroom practices when employing technology as a pedagogic tool. The findings of this ethnographic case study show that, while teachers have become technically skilled through continuous professional teacher development (CPTD), they have also begun to reflect more rigorously on constructivism as a learning theory. Data was generated through semi-structured interviews and classroom observations with digital video recordings. Observations revealed a perceived gap in the use of the IWB as a promising space to generate reciprocal dialogue in classrooms to influence curriculum delivery and learning. This paper argues, therefore, that IWBs can become spaces for dialogic engagement to expand learners' participation and higher order thinking skills through pedagogic strategies. Thus, there is a need to introduce Foundation Phase teachers to dialogic teaching methodologies and the potential impact thereof on learner engagement and learning.

**Keywords:** Interactive whiteboards, technology integration, digital literacy, dialogic spaces, dialogic teaching

### INTRODUCTION

The presence of technology compels teachers who have been trained prior to the emergence of digital technologies in classrooms and who are not technologically skilled, to first become efficient users of technology. This is so because 21<sup>st</sup>-century learners are said to be 'digital natives' who are spending most of their time 'surfing' and playing games on ICTs such as smartphones and tablets. Consequently, many South African classrooms in urban areas are equipped with interactive whiteboards (IWB) and other ICT tools for teaching and learning. The White Paper on e-Education (DoE, 2004) views ICTs as a vehicle to access learning opportunities and, at the same time, redress inequalities of the past. Learners and teachers, therefore, are expected to be able to function in a knowledge-society by using appropriate technology and mastering communication and collaboration skills (DoE, 2004). One of the overarching policy goals set out in the e-Learning policy (2004) is that "every South African learner in the General and Further Education and Training bands (GET and FET) will be ICT-capable ...". There is thus the assumption that teachers should be ICT capable. The discourses around teachers' efficacy, proficiency and attitude towards technology integration in the classroom are buttressed by the discourse of "technology as delivery of learning", and also resonate within the research arena internationally (Hannon & Bretag, 2010:106). Research by Stroud, Drayton, Hobbs and Falk (2014:46) report that when teachers use the IWB infrequently, without taking advantage of the IWBs' interactive features, it is not sufficient to reap the benefits reported in the literature.

The aim of this paper is to understand how teachers use the IWB in their classrooms for curriculum delivery. The researchers, therefore, asked the following question which gave drive and focus to the study:

How are teachers using the interactive whiteboard (IWB) as a space for dialogic engagement to stimulate learner participation and higher order thinking skills?

To answer the above question, the Technological, Pedagogical and Content Knowledge (TPACK) framework by Mishra and Koehler (2006) was employed to guide the study. A qualitative research approach was used to gather data whereby semi-structured interviews were used to explore the purposively sampled teachers' perceptions and use of IWBs in their classrooms. Observations were also used to gather information on how the teachers are using the ICT tools. Results show that availability of IWBs in the classrooms is welcomed by teachers; however, optimal use of dialogic pedagogies has yet to become part of their teaching repertoires.

### **CONCEPTUAL FRAMEWORK**

The conceptual framework which guided the study drew on the TPACK framework of Mishra and Koehler (2006). Technological knowledge (TK) involves a fluency of technological information that goes beyond traditional notions of computer literacy. It requires persons to understand information technology broadly enough to apply it productively at work and in their everyday lives, to recognise when information technology can assist or impede achievement of a goal, and continually adapt to changes in information technology. TK encompasses a comprehensive understanding of modern technologies such as computers, the internet, digital video, IWBs, data projectors, and multimodal software applications. The introduction and integration of emerging technologies or ICTs in the classrooms, as an approach to transforming learning and teaching, requires teachers to reflect on their current classroom practices. TPACK, as a framework, is essential for teachers to promote effective teaching with technology. As newer technologies continue to emerge and permeate all levels of society, schools have been compelled to focus on how the professional development and support of teachers might contribute towards enhancing and developing this emerging knowledge domain as a means of enhancing teachers' digital competencies and skills.

Koehler and Mishra (2009:61) explain that TPACK examines the entire teaching performance. Technology integration does not require one single pedagogical orientation but a spectrum of approaches to teaching and learning. Harris and Hofer (2011:211-229) acknowledge the current gap in the literature that addresses how teachers' knowledge and beliefs influence the pedagogical decisions teachers make while planning to integrate technology into their teaching. Due to this gap there is an advocacy (Ager, 2013:19) in more recent literature for the incorporation of technology, even in the primary grades. Starkey (2012:110) describes a 'digital age' teacher as one whose practice of teaching is enabled by the use of digital tools and the extensive information on, and analysis of, students' learning progress. Extensive academic knowledge of their teaching domain, how students learn and create knowledge, how to critique and use evidence to inform their teaching practice, and how to establish and maintain learning relationships within their teaching and professional contexts, further characterises the 'digital-age' teacher.

### **LITERATURE**

According to Pahomov (2014:6), technology can increase democracy in teaching-learning interaction in a variety of ways. Integrated technology can also support an intentional shift toward a more democratised classroom structure because, together with the Internet, it allows for infinite possibilities for innovative learner-centred activities in the classroom.

Learner-centred teaching methodologies that receive minimal attention around the IWB relate to the concept of dialogic teaching. Wegerif (2005:2) argues that 'dialogic' is the idea that meaning-making requires the inter-animation of more than one perspective. He further posits that dialogue and dialogic are the key to 'learning to learn' and other higher-order thinking skills. The unique features of the IWB, therefore are suited particularly to inducting learners into dialogues. According to Bakhtin (1986) and Wegerif (2007), as cited in Hennessy and London (2013:7), dialogue is more than just 'talk', it is the shared enquiry that bridges the gap between two or more perspectives. The dialogic view shares with socio-cultural theory the idea that individual thinking skills originate in mediated dialogues. The sample in this research study is familiar with the constructs of higher order thinking as proposed by Resnick's Principles of Learning (1983). These principles underpin the teaching methodology of the sample. These principles are: academic rigour; accountable talk; clear expectations; socialising intelligence; self-management of learning; credible and fair evaluation; organising for effort; recognition of accomplishment.

### **DIALOGIC APPROACHES TO TEACHING AND LEARNING**

Wegerif's research (2005:2) on the concept of 'dialogic' teaching is firmly rooted in the work of Bakhtin (cited in Holquist, 1990) and his literary theory. Bakhtin (1981) views language as a social practice – all language, indeed all thought, is dialogic. The concept of 'dialogical meaning-making' allows the learner to play an active role in developing a personally constructed understanding of the curriculum through a process of dialogic interchange. Bakhtin (1981) distinguishes between monologic and dialogic talk, which are both functions of discourse. Monologic talk focuses the power on the teacher and, therefore, stifles dialogue and interaction

between learners and their ideas. Hence, it reduces teacher and learner agency in favour of delivering curriculum content. Bakhtin (1981) claims that dialogic talk creates a space for multiple voices and classroom discourse that challenge power relations constructed by monologic practices. There has been a move in recent years against the power discourse which has long been the preserve of the teacher in front of the classroom, to methodologies that value 'talk' and promote a dialogic discourse (Lyle, 2008:225). The IWB, whole-class teaching and small-group teaching approaches allow for the creation of such dialogic spaces. Alexander (2006:35) identifies the essential features of the dialogic classroom as being:

- Collective: teachers and children address learning tasks together, whether as a group or a class, rather than in isolation
- Reciprocal: teachers and children listen to each other, share ideas and consider alternative viewpoints
- Supportive: children articulate their ideas freely, without fear of embarrassment over 'wrong' answers, and they help each other to reach common understandings
- Cumulative: teachers and children build on their own and each other's ideas and chain them into coherent lines of thinking and enquiry
- Purposeful: teachers plan and facilitate dialogic teaching with particular educational goals in view.

Hennessy (2011:463) proposes that classroom dialogue in the context of IWB use is construed as being facilitated by teachers and learners constructing digitally represented knowledge artefacts together. Thinking then becomes emergent, rather than a finished product of dialogue. Research by Kennewell, Tanner, Jones and Beauchamp (2008: 61) investigated the impact of IWBs on learner-teacher interaction. It was noted that the IWB has failed to support the envisaged shift of control away from the teacher to learners' self-directed learning. Advocates of dialogic engagement (Gutierrez & Larson, 1995:450) lament the absence of interchange, of genuine conversations in classrooms where learners are prevented from developing both a voice and a critical awareness of their own ends, means and capacities in learning. Lyle (2008: 228) raises the notion of barriers to implementing dialogic teaching as: the dominance of the teacher's voice at the expense of learners' own meaning-making voices. The power relationship between teachers and learners, albeit not always a negative one, could be a further stumbling block to authentic dialogue in classroom settings.

### **THE IWB THROUGH A SOCIO-CULTURAL LENS**

In case study research on the leveraging of the IWBs as a learning tool, Guomundsdottir *et al.* (2014:25) refer to the mediocre use of the IWB in terms of pedagogical usage. It was found, therefore, to be expedient to view teachers' engagement with the IWB in this study through the lens of socio-cultural theory. This theory has become an important influence in studies of ICT education. A key aspect of socio-cultural theory (Vygotsky, 1978; Wertsch, 1985; Wertsch, 1991) is the claim that all human action is mediated by 'technical' and 'cognitive' tools. Sutherland *et al.* (2009:10) interpret the idea of a 'tool' to include a wide range of technologies and artefacts.

Within this broad conception of tools, the master tool is language. Premises for investment in technology have lacked clarity at school level, while, at the same time, technology itself has undergone considerable changes in the last decade. According to Haugsbakk (2011:249) teachers' pedagogical judgments have also often been replaced by more instrumental perspectives on the development of both technology and society. He claims that little or no attention has been paid to how the use of technology can result in greater complexity, doubt, and uncertainty. As a consequence of this pro-instrumental approach, digital technologies have often been described metaphorically as 'instruments or tools'.

Tools are something humans develop to ease or automate processes, to save time (and money) and to achieve results more efficiently. As Haugsbakk (2011:250) points out, the challenge of metaphors such as 'tools' is that they reduce or hide complexity. They also obscure the potential of digital technologies both to transform existing practices and to pave the way for new ones – not least in the field of learning and teaching (Hauge, Lund & Vestol, 2007; Lund & Hauge, 2011b). The latter authors make a critical observation, namely that there is a need to theorise the relationship between tool and agent in order to unpack this relationship's inherent potential and what is at stake when it is integrated in learning and teaching activities.

Wertsch's (1991:119) idea of 'person-acting-with-mediational-means' considers concepts such as appropriation and instrumentation. Appropriation is important to the analysis in which ICT tools are incorporated in subject domains, and instrumentation explains why different people arrogate the same tool in different ways. So, rather than conceiving the individual as having 'abilities and skills', the focus is on the 'person-acting-with-mediational-means'.

## THE AFFORDANCES AND BARRIERS OF INTERACTIVE WHITEBOARDS

Currently, IWBs are seen as powerful tools for aiding teaching and learning in the classroom context. Teachers wanting to explore the benefits of digital technology, therefore, need to know that technology comes with affordances and barriers.

The functionalities of the IWB promise a fully immersive, interactive and visual experience, and thus the IWB has become a vehicle for driving digitally enhanced lessons in classrooms. According to Bucy and Tao (2007:647) interactivity can be understood as a technological feature of mediated surroundings where people communicate and exchange information and interact with technology or with other people through technology. Beauchamp and Kennewell, (2010:759) argue that interactivity from a pedagogical stance can be reached through dialogue when teachers and learners interact and collaborate. Mercer, Warwick, Kershner and Staarman (2010:367) define notions of ‘dialogic teaching’, also known as ‘dialogic pedagogy’, in which the relationship between the guiding role of the teacher and children's active involvement in their own learning is highlighted. In further research by Kershner, *et al.* (2010:380) the benefits of teaching with an IWB are the enhancement of learner attention and communication. The external representations of thinking on a large screen support productive talk. Wegerif (2005:2) states that the main role of technology in teaching thinking skills, should be to open and maintain ‘dialogic spaces’ in which different perspectives co-exist and inter-animate each other.

Although the adoption of IWB technology has influenced teaching methodologies and pedagogical decisions in the classroom, Jacobsen (2001) asserts that the gap between the presence and use of an IWB as a tool is too wide. Furthermore, research by Lewin, Somekh and Steadman (2008:99) reveals that IWBs can facilitate the emergence of new digital pedagogic practices. It reduces the teacher’s cognitive load by providing an ‘invisible script’ which allows that teacher to ‘multi-task’ in new ways, by releasing greater mental capacity to make observational assessments for learning during whole-class teaching.

The affordances of the IWB as an artefact thus can hardly be ignored in the Foundation Phase classroom. According to Loveless (2003:5) these IWB affordances, as a means to improve cognition through technological mediation of shared thinking, can be mapped as follows:

- Speed and automatic functions: enabling large amounts of information and routine tasks to be automated
- Provisionality: the ability to change texts and other outputs
- Interactivity: the capacity for feedback and response
- Range: the capacity to overcome barriers of time and distance
- Multi-modality: the capacity to integrate a range of modes of communication including film, graphics, sounds and texts (adapted by Wegerif, 2005:7).

In conjunction with the holistic teaching approach of the Foundation Phase teacher, the IWB becomes a medium for pedagogically supported technology integration which is visual and engaging and creates a focal point for whole-class learning.

Besides barriers of a technical nature that were experienced by the teacher participants in the initial stages of the implementation phase of the study under review, other constraints must be mentioned. None of the participants, however, exhibited ‘technophobia’; although, initially, some concerns around confidence and issues of efficiencies were raised and observed, but exposure to technology integration at workshops allayed initial uncertainties as teachers gained skills and competencies.

Constraints which interrupted the use of technology – more specifically the IWB – and which were outside the participants’ control, was load-shedding. This happened when the local supplier of electricity was unable to meet the demands of its consumers, resulting in the shutdown of electrical power, on a rotational basis, to prevent the failure of the entire system. These interruptions of the electricity supply could also occur at unscheduled times, with the result that teachers needed a back-up plan for their lessons should they not have access to electricity and the internet. Other external factors, which occur regularly at some schools, are acts of vandalism and theft which impact the sustainability of purchasing and storing expensive digital resources and equipment.

## RESEARCH DESIGN

The research setting for this study simulates that of an ethnographic case study. The intent of ethnographic research is to obtain a holistic picture of the subject of study, with emphasis on portraying the everyday experiences of individuals by observing and interviewing them and relevant others. Ethnography allows considerable flexibility in the choice of methods used to obtain information about a culture (Creswell, 1998). The researchers needed to understand how the participant teachers engage with and through technology and also

describe their acquisition of technological knowledge and skills. It was necessary, therefore, to select a methodology that would be appropriate to the subjective description of the human experience.

Throughout the eighteen-month period that this investigation was in operation, opportunities to become fully immersed within the ecology of the Foundation Phase classrooms, allowed for rich data collection on the utilisation of the IWB within the teaching context. The duration of this study made it possible to evaluate the embedding of the IWBs. Observations covered the installation phase of the IWBs, persisted throughout the continuous professional teacher development (CPTD) phase, followed the development of teachers' technological skills and competencies, and recorded how lessons were executed during formal lesson observations. This multi-faceted observational process allowed a clearer understanding of the uniqueness of each participant.

In this study a predominantly qualitative paradigm was employed in which the choice of method is a multiple case study that adopts a 'within-case' and a 'cross-case' analysis approach. Merriam (1998:40) notes that the inclusion of multiple cases within a case study is a means by which the external validity or generalisability of study findings can be enhanced. Nevertheless, selecting a case study as the research method proved to best fit the data collection and analysis for this study for several reasons. The researchers wanted to investigate thoroughly a particular phenomenon, namely the integration of IWB into the classroom, not to generalise but to begin to understand the phenomenon. Case studies are 'intensive' and, according to Sayer (1992), call for 'intensive research' that requires detail, richness, completeness and variance or depth. In this case study the issue is probing Foundation Phase school teachers' acquisition and development of TPACK to support their learning about instructional technologies.

### **SAMPLE**

The investigation for this study was conducted with a purposive sample of six in-service Foundation Phase teachers at an independent and donor-funded school in Cape Town, South Africa. Each teacher participant in this study constitutes a unique case which is influenced by their past experiences, perspectives of teaching and learning, formal teacher preparation and ongoing professional development. All the teachers in the sample have been teaching for longer than seven years and subscribe to the ethos and culture of the school. They have experienced the progression from a traditional mandated curriculum, to a curriculum underpinned by Resnick's (1983) Principles of Learning, which strongly advocate an application of a 'constructivist theory of instruction' to the adoption of technologically enhanced methodologies in the classroom through the use of information and computer technology (ICT).

### **DATA COLLECTION AND DATA ANALYSIS**

The study used semi-structured interviews to explore participant teachers' perceptions and use of IWBs in their classrooms. The open-ended questions probed the affordances and the barriers that teachers experienced during the phases of embedding the IWB technology. Observations with digital video recording were guided by a Technology Integration Assessment Instrument (Harris, Grandgenett & Hofer, 2010:323). This instrument provided a structured understanding of lesson content, planning, teaching, as well as choice of digital tools.

To quote McMillan & Schumacher (2014:353-354), "the qualitative phases of data collection and analyses were interwoven and occurred in overlapping cycles". These phases were: planning; beginning data collection; basic data collection; closing data collection; and the completion phase. All aspects pertaining to the collation and analyses of data took place during the completion phase. Data collecting was blended into formal data analysis and construction of meaningful ways to present the data. This analysis included the transcription of the audio-recorded semi-structured interviews. The semi-structured interviews with the participants were then transcribed, using an open-source generic transcription tool. After repeated checking that the interviews were transcribed verbatim, the transcripts were coded using open and in-vivo coding protocols in the Atlas.ti software. Through this feature of the software, 'document families' and 'quotations' narrowed the analytic focus, which helped to shape the data for interpretation and explanation (Lester & Paulus, 2011:671). The video footage was watched a number of times and then coded, based on the categories in the TPACK framework. The multiple viewing of the video data allowed for a layered approach, searching for subtle nuances that are hidden in the data and which only become visible after several viewings. At the same time the nature of the conversations between the teachers and learners revealed the dominant forms of dialogue used during teaching. Once data saturation was reached, the researchers were ready to leave the field, in the words of McMillan and Schumacher (2014:354): "the field residence terminates".

### **LIMITATIONS**

The investigation under review was confined to an independent school in the Western Cape Province of the Republic of South Africa. Selecting a case study approach has limitations that pertain to lack of generalisability.

This limitation must be acknowledged (Yin, 2009:15). Simons (2009:23), however, posits that its unique strengths are its ability to deal with a full variety of evidence – documents, artefacts, interviews and observations – which underpin the nature of this kind of study. She further postulates that ethnographies usually require long periods in the ‘field’ and emphasises detailed, observational evidence, a prerequisite the researchers could adhere to, due to their unique position in relation to the research site. One of the researchers has been teaching at the research site for a number of years.

### **ETHICAL CONSIDERATIONS**

Ethical safeguards were observed and measures were taken to ensure that all the necessary requirements to conduct this investigation were met (Hartas, 2010:117). Assurances of confidentiality and anonymity of the site, organisation, participants and other individuals were given and maintained during and after the research process. Permission was also obtained from the school where this research was conducted.

### **RESULTS AND DISCUSSION**

Following the analysis of the data collected, the results and discussion of the study will be presented under the following themes:

- i) Dialogic pedagogies when using the IWB
- ii) Need for technological pedagogical knowledge (TPK)
- iii) Inflexible curriculum design impacting on the use of IWB

#### **i. DIALOGIC PEDAGOGIES WHEN USING THE IWB**

The use of the IWB in this study revealed an under-utilisation of its potential, despite the IWB’s many affordances, which this paper outlines. The study found limited evidence of extended learner dialogue around the IWB during the classroom observations. Linked to any level of IWB use is the need to also include some learner ownership of the board, arising from opportunities for focused cumulative, open-ended discussions. Researchers observed that when seated around the IWB, learners would intermittently be summoned to select answers through the touch functionality of the board. Evidence of learner responses thus appeared to be short and limited and focused on identifying the correct answers in the activity displayed on the IWB. The touch functionality was limited to novelty engagement. Teachers would often dominate the discussion. In line with research recorded by Mercer (2000: 52-56), the observed teachers were inclined to summarise and review information; ask questions to stimulate recall; repeat a learner’s answer; paraphrase a learner’s response; or encourage learners’ to ‘think’ or ‘remember’ what was said earlier. All these strategies allude to teachers’ inability to stimulate dialogic engagement to elicit learners’ verbal responses to verbalise their [learners] own ideas and thinking. Hence there was a lack of “dialogic exchange” that can foster a deeper engagement and conceptual understanding (Cullen, 2002:117).

Analysis of the data collected showed that despite the participants’ technological fluency when using the IWB, optimal use of dialogic pedagogies has yet to become part of their teaching repertoire when employing the IWB. Shortly after being introduced to the native software which was installed on the IWBs and the knowledge gained at a CPTD workshop, teachers were motivated to explore the potential offered by the various applications through the multi-modal features of the IWB. The teacher participants related that digitally enhanced lessons extended learner engagement and motivation.

One respondent commented: *“Technology makes the lessons interesting and interactive. I like that there is some sort of communication between themselves, the teacher, their peers and whatever programme.”* Another responded: *“The children were in awe of the visuals and showed a renewed interest in the lessons. Since I started using the IWB, my teaching has been enhanced and learners greatly enjoy being actively involved in lessons in this way.”*

The observations in the classrooms also reflected that there was a more observable constructivist approach from the teacher, which led to greater learner engagement. Beetham and Sharpe (2007:2-3) contend that “pedagogy itself needs to be reconsidered in order to link technology and transformation” and that a constructivist alignment provides the possibility of a shared dialogue within the dialogic space afforded by the IWB.

There is no doubt, therefore, that dialogic teaching pedagogies as proposed by Alexander (2001), Nystrand *et al.*, (1997) and Wells (1999), together with the use of an IWB, create opportunities that can promote inclusion because it promotes learners as a social collective. According to Lyle (2008: 233), concepts undergirding dialogic approaches in classroom practice call for teachers to engage children as co-collaborators in meaning-making by planning lessons that will generate dialogue which will lead to deep learning and participation and not only test what they already know.

## ii. NEED FOR TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE (TPK)

It was clear that the participant teachers needed to find a balance between the curriculum deliverables and the use of technology. It was also noted that such a shift towards technologically enhanced teaching needed to be sustained, because some teachers tended to fall back into old and familiar routines.

The conducted research validated teachers' acquisition of technologically enhanced methodologies through continued teacher professional development. It also acknowledges that teacher perspectives on learning and technology are no longer considered didactic opponents, but is congruent as a tool to mediate learning. The TPACK conceptual framework illustrates the knowledge domains needed by the teacher to teach effectively with technology so that it is "integrative and transformative" (Shulman, 1986). The seven knowledge domains put forward by Mishra and Koehler (2006:1026-1027) include content knowledge; pedagogical knowledge; technological knowledge; pedagogical content knowledge; technological content knowledge; technological pedagogical knowledge. This framework provides categories to measure and understand teachers' development of TPACK.

All these components amalgamate as TPACK, which is an emergent form of knowledge that extends beyond all three 'core' components (content, pedagogy and knowledge). Underlying truly meaningful and deeply skilled teaching with technology, TPACK is different from knowledge concepts of all three components individually. Developing a TPACK mind-set is thus modelled as a 'constructive and iterative' process (Borko & Putnam, 1996:673) during which teachers need to reflect on and carefully revise multiple experiences and events for teaching their content with appropriate technologies.

One participant responded as follows: *"I made a deliberate decision to start getting to know technology and the IWB, although I don't read up a lot about it. It is just about finding my own way around technology."* Another participant said: *"... I can explain things better when I use technology."*

Understanding the purpose of technology within a given context underpins the understanding of technological pedagogical knowledge (TPK). Initially teacher participants who were less confident also lacked the terminology to explain the constraints that they experienced. In the majority of the classroom observations, it was noted that the IWB was used mainly as a presentation tool, thus the teacher was automating how lessons were taught prior to the presence of the IWB, which defeated the purpose of authentic and purposeful technology integration. To quote one participant: *"You know the IWB might go on everyday and I might just have a worksheet displayed on there. Next year I want to use it fully and not only display information."*

## iii. INFLEXIBLE CURRICULUM DESIGN IMPACTING ON THE USE OF IWB

Another critical and constraining factor relates to the delivery of the curriculum. The limitations of a content-laden and tightly scripted curriculum were raised as a damper to technological innovation. Other constraints mentioned by the teacher participants related to time needed to 'cover' the curriculum content, for example: *"I am motivated to use it [IWB], I must admit the obstacle that I obviously have is time, because I need time to research. But I do feel motivated to use it."* On constraints related to the curriculum another participant responded as follows: *"... but I think this year with the new curriculum (CAPS), I need to put my head around CAPS and put my head around planning of my lessons and my assessments, especially. I think that was a bit of a challenge for me this year."*

Technical difficulties that were experienced initially related to calibrating the software and regular power outages. Some of the technical 'glitches' became less of a hindrance as teachers became technically skilled. At times technical difficulties also contributed to the constraints experienced and added to participants' frustrations: *"I actually downloaded some of my things, then my Laptop crashed and it had to be re-done. This new one was on the point of crashing and then he[administrator] had to install some other software programmes."*

Analyses of the video-recorded data revealed that the teacher participants' interaction and use of the IWB related closely to Asmavi's (2005:213) modalities of learning using the IWB and are, therefore, characterised by:

- (1) visual learning through the use of text and pictures, animation and video;
- (2) auditory learning through pronunciation, listening to sounds or music;
- (3) tactile learning through the students' physical interaction with the IWB, all of which makes it suitable for creating digital stories in the classroom.

## CONCLUSIONS AND RECOMMENDATIONS

This study has considered teachers' development of technological knowledge when integrating technology through the use of the IWB in the Foundation Phase classroom. Despite teachers acquiring technological skills,

and developing a fluency in using the IWB, evidence from classroom observations found that there was a perceived gap in dialogic teaching methodologies.

Competency, attitude and support counted as some of the more influential factors when teachers gained knowledge of technological tools accompanied by the relevant pedagogies in this study. The IWB as a digital artefact brings technology into the Foundation Phase classroom. However, the IWBs' untapped potential has yet to make inroads in how teachers employ this digital artefact as a dialogic space in the classroom. Technology integration practices still fall short of extracting its dialogic perspective to aid teaching and learning – more so in the language classroom, where digital literacies are still taught alongside traditional print literacies. It is evident from the literature that if well-used, IWBs can transform teaching in the language classroom which can greatly enhance learner agency.

More specifically, the potential to stimulate higher-order thinking skills during lessons remains under-utilised. Learners' perceptions and use of digital tools are closely associated with the stimulation provided by video and other online games which can entertain them for hours. Digital games are said to improve cognition and strategic thinking and are found to engage learner attention. Together with dialogic teaching practices, exposure to 'gaming' as a digital skill could be incorporated during staff development activities to create awareness of how gaming can be incorporated as a potential strategy when using the IWB and how it aligns with constructivist approaches.

What was further observed in this study was that the enactment of the curriculum was seen as separate from technology integration. Teachers need better designed professional development opportunities to come to the understanding that when planning lessons, these should be content-based and that technology should be used purposefully and selected to be aligned with the instructional outcome. It remains critical that teachers keep abreast of changes in the effective use of new technologies and manage a flexible classroom curriculum that can accommodate the affordances of technology for learner use.

Technology integration in the classroom calls for new approaches to teaching practices to leverage fully the affordances of IWBs. A Becta (2004:2) review describes the IWB as a powerful teaching tool that has the potential to: enhance demonstration and modelling; improve the quality of interactions and teacher assessment through the promotion of effective questioning, redress the balance of making resources and planning for teaching; and increase the pace of learning.

In this paper the authors offer suggestions, based on extensive research by Alexander (2006:35), who defines dialogic teaching as the exploration of the learner's thought processes: "It treats students' contributions, especially their answers to teacher questions, as stages in an ongoing cognitive quest rather than as terminal points." Furthermore, in dialogic interactions, learners state points of view and comment on ideas which arise in the lesson. Such a process nurtures students' engagement, confidence, independence and responsibility." He proposes that teachers need other repertoires to move away from monologic teaching towards a dialogic classroom, which will probe more deeply children's thinking and understanding.

The availability of this technology challenges the assumptions of the role of technology in learning. Evidence suggests that teacher proficiency and confidence increased following focused professional development as was borne out by this study. It is, therefore, incumbent on the school's leadership to ensure that teachers' continued professional development activities consider how dialogic teaching pedagogies, together with the use of the IWB, can lead to integration practices that will deepen learner engagement through the elements of dialogue and participation, so that learners will benefit from a richer learning experience.

The domestic literature on technology integration in the classroom needs to report on a larger scale on the affordances of the IWB in the Foundation Phase classroom. Such research can contribute to the debate on the effectiveness of the IWB as a digital artefact that can support dialogic pedagogies.

## REFERENCES

- Ager, A. (2013). Annual research review: resilience and child wellbeing-public policy implications. *The Journal of Child Psychology and Psychiatry*, 54, 488-500.
- Alexander, R.J. (2001). *Culture and pedagogy: International comparisons in primary education*. Oxford: Blackwell.
- Alexander, R.J. (2006). *Towards dialogic teaching*. (3rd ed.). New York: Dialogos.
- Asmawi, R. (2005). Interactive whiteboard: A new dimension in teaching and learning. *Pendidikan Jilid*, 27:213-219.



- Bakhtin, M.M. (1986). “The problem of speech genres”, in: Emerson, C. & Holquist, M. (eds.), *Speech genres and other late essays*. Austin, TX: University of Texas Press.
- Bakhtin, M.M. (1981). *The dialogic imagination: Four essays by M.M. Bakhtin*. Austin, TX: University of Texas Press.
- Beauchamp, G. & Kennewell, S. (2010). Interactivity in the classroom and its impact on learning. *Computers and Education*, (54), 759-766.
- Becta. (2004). Getting the most from your interactive whiteboard: A guide for primary schools. Becta ICT Advice. Millburn Hill: Coventry.
- Beetham, H. & Sharpe, R. (2007). *Rethinking pedagogy for a digital age: designing and delivering e-learning*. London: Routledge.
- Borko, H. & Putnam, R.T. (1996). Learning to teach. In Berliner, D.C. & Calfee, R.C. (eds). *Handbook of Educational Psychology* (pp. 673-709). New York: Macmillan.
- Bucy, E. P. & Tao, C. C. (2007). The mediated moderation model of interactivity. *Media Psychology*, 9(3), 275-672.
- Cresswell, J.W. (1998). *Qualitative enquiry and research design: Choosing among five traditions*. Thousand Oaks, Ca: Sage.
- Cullen, R. (2002). Supportive teacher talk: the importance of the F-move. *ELT Journal*, 56 (2), 117-127. DoE see South Africa. Department of Education.
- Guomundsdottir, G., Dalaaker, D., Egeberg, G., Hatlevik, O. & Tomte, K. (2014). Interactive technology. Traditional practice? *Nordic Journal of Digital Literacy*, 9 (1).
- Gutierrez, K. & Larson, J. (1995). Script, counterscript, and underlife in the classroom: James Brown versus Brown v. board of education. *Harvard Educational Review*, 65 (3), 445-471.
- Hannon, J. & Bretag, T. (2010). Negotiating contested discourses of learning technologies in higher education. *Educational Technology and Society*, 13(1):106-120.
- Harris, J., Grandgenett, N. & Hofer, M. (2010). Testing a TPACK-based technology integration assessment instrument. In Maddux, C.D., Gibson, D. & Dodge, B. (eds). *Research Highlights in Technology and Teacher Education 2010* (pp. 323-331). Chesapeake, VA: Society for Information Technology and Teacher Education (SITE).
- Harris, J.B. & Hofer, M.J. (2011). Technological pedagogical content knowledge (TPACK) in action: A descriptive study of secondary teachers’ curriculum-based, Technology-related instructional planning. *Journal of Research on Technology in Education*, 43(3):211-229.
- Hartas, D. (2010). (ed.). *Educational research and enquiry: Qualitative and quantitative approaches*. London: Anthony Rowe.
- Hauge, T.E., Lund, A. & Vestol, J.M. (2007). *Teaching in transformation: ICT, Activity, Design*. Oslo: Abstrakt Forlag.
- Haugsbakk, G. (2011). ICT in schools with teachers on the sidelines. Critical gaze on school foundation documents. In Hauge, T.E. & Lund, A. (eds). *Small Steps or Leaps. About Digital Conditions in Schools* (pp. 249-273). Oslo: Cappelen Academic.
- Hennessy, S. & London, L. (2013). Learning from international experiences with interactive whiteboards: The role of professional development in integrating the technology. OECD Education Working Paper No 89. OECD Directorate for Education.
- Hennessy, S. (2011). The role of digital artefacts on the interactive whiteboard in supporting classroom dialogue. *The Journal of Computer Assisted Learning*, 27 (6), 463-489.
- Holquist, M. (1990). *Dialogism: Bakhtin and his world*. London: Routledge.
- Jacobsen, M. (2001). Building different bridges: Technology integration, engaged student learning, and new approaches to professional development. Paper presented at AERA 2001: What we know and how we know it, the 82nd Annual Meeting of the American Educational Research Association, Seattle, WA, April 10-14.
- Kennewell, S., Tanner, H., Jones, S., & Beauchamp, B. (2008). Analysing the use of interactive technology to implement interactive teaching. *Journal of Computer Assisted Learning* 24 (1), 61-73.
- Kershner, R. Mercer. N. Warwick. P. & Staarman. J., (2010). Can the interactive whiteboard support your children's collaborative communication and thinking in classroom science activities?. *International Journal of Computer-Supported Collaborative Learning*, 5(4), 359-383.
- Koehler, M.J. & Mishra, P. (2009). What is technological pedagogical content knowledge? *Contemporary Issues in Technology and Teacher Education*, 9(1). <http://www.citejournal.org/vol9/iss1/general/artical1.cfm>. [Retrieved: 18 May 2015].
- Lester, J. & Paulus, T. (2011). Accountability and public displays of knowing in an undergraduate computer-mediated communication context. *Discourse Studies*, 13(6):671-686.
- Lewin, C., Somekh, B. & Steadman, S. (2008). Embedding interactive whiteboards in teaching and learning: The process of change in pedagogic practice. *Education and Information Technologies*, 13(4), 291-303.

- Loveless, A. (2003). Creating spaces in the primary curriculum: ICT in creative subjects. *The curriculum Journal* 14 (1), 5-21.
- Lyle, S. (2008). Dialogic teaching: Discussing theoretical contexts and reviewing evidence from classroom practice. *Language and Education*, 22(3). Swansea, Wales: Institute of Higher Education.
- Lund, A. & Hauge, T.E. (2011b). Technology in use - Some lessons about change in schools and teacher professional development. *Nordic Journal of Digital Literacy*, (4):204-206.
- McMillan, J.H. & Schumacher, S. (2014). *Research in Education: Evidence-based Enquiry*. 7<sup>th</sup> ed. London: Pearson.
- Mercer, N., Warwick, P., Kershner, R. & Kleine Staarman, J. (2010). Can the interactive whiteboard help to provide 'dialogic space' for children's collaborative activity? *Language and Education*, 24(5), 367-384.
- Mercer, N. (2000). *Words and minds: How we use language to think together*. London: Routledge.
- Merriam, S. (1998). *Qualitative research and case study applications in education*. 2<sup>nd</sup> ed. San Francisco: Jossey-Bass.
- Mishra, P. & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teacher's College Record*, 108(6):1017-1054.
- Nystrand, M., Gamoran, A., Kachur, R. & Prendergast, C. (1997). *Opening dialogue: Understanding the dynamics of language and learning in the English classroom*. New York: Teacher College Press.
- Pahomov, L. (2014). *Authentic Learning in the Digital Age: Engaging Students Through Enquiry*. Alexandria, Virginia: ASCD.
- Resnick, L.B. (1983). Toward a cognitive theory of instruction. In Paris, S.G., Olson, G.M. & Stevenson, H.W. (eds). *Learning and Motivation in the Classroom* (pp. 5-38). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Sayer, A. (1992). *Method in social science. A realist approach*. London: Routledge.
- Shulman, L.S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2):4-14.
- Simons, H. (2009). *Case Study Research in Practice*. London: Sage.
- South Africa. Department of Education. (2004). *White Paper on e-Education: Transforming learning and teaching through information and communication technologies*. Department of Education. Pretoria: Government Printer.
- Starkey, L. (2012). *Teaching and Learning in the Digital Age*. New York: Routledge.
- Stroud, R. Drayton, B. Hobbs, K. & Falk, J. (2014). Interactive whiteboard use in high-tech science classrooms: Patterns of integration. *IJET*, 9 (9). *Blended learning*.
- Sutherland, R., Robertson, S. & John, P. (2009). *Improving classroom learning with ICT*. New York: Routledge.
- Vygotsky, L.S. (1978). *Mind and Society: The development of higher mental processes*. Cambridge, MA: Harvard University Press.
- Wegerif, R. (2005). Towards a dialogic understanding of the relationship between CSCL and teaching thinking skills. School of Education, University of Southampton.
- Wegerif, R. (2007). *Dialogic, education and technology: Expanding the space of learning*. New York: Springer.
- Wells, G. (1999). *Dialogic Inquiry: Towards a sociocultural practice and theory of education*. Cambridge: Cambridge University Press.
- Wertsch, J.V. (1985). *Culture, communication and cognition: Vygotskian perspectives*. Cambridge: Cambridge University Press.
- Wertsch, J.V. (1991). *Voices of the mind. A socio-cultural approach to mediated action*. London: Wheatsheaf.
- Yin, R.K. (2009). *Case study research: Design and methods*. 4<sup>th</sup> ed. Thousand Oaks CA: Sage.

Financial assistance from the Cape Peninsula University of Technology, PO Box 652, Cape Town, 8000 (University Research Fund) is acknowledged.