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THE USE OF INTERACTIVE WHITEBOARDS IN URBAN GAUTENG CLASSROOMS

ABSTRACT

There are teachers that have technology in their classrooms that is underutilised or not used at all because of factors like technical problems, lack of training or support or teachers' negative attitudes. This study wanted to determine the impact of the use of interactive whiteboards (IWBs) in primary and secondary urban classrooms in Pretoria, Gauteng. Interactive whiteboards are one of the technologies that are most commonly used in education worldwide. Technology has taken over our lives and it is becoming more necessary for upcoming generations to become technologically proficient. The overall purpose of the study was to determine the external factors, perceived ease of use, perceived usefulness, the attitudes of educators and learners towards technology, the behavioural intention to use the technology and the actual use of the technology according to the technology acceptance model (TAM).

This was a qualitative case study and the researcher collected data from three secondary and six primary schools in Gauteng. She sent questionnaires to the schools and obtained answers from 30 secondary school and 99 primary school teachers. It was determined that more primary school teachers use the IWBs than secondary school teachers and they also use it more effectively. Most of the teachers find the IWBs easy to use and integrate the technology in their lessons. Teachers also indicated that the IWBs are very useful for saving their work, it helps them make lessons more interactive, visual and interesting and that the use of the technology motivates learners to participate.

Key words: Attitudes, interactive whiteboards, external factors, perceived ease of use and usefulness, technology acceptance model, urban Gauteng classrooms

1. INTRODUCTION

Many teachers have technology in their classrooms that is underutilised or not used because of technical problems, lack of training or support or teachers' negative attitudes. The study wanted to determine the impact of the use of interactive whiteboards (IWBs) in primary and secondary urban classrooms in Pretoria, Gauteng. The topic was chosen because of the researchers' interest in IWB technology. She undertook a previous study in rural classrooms in Mpumalanga and also evaluated the IWB

situation in England. There are also very few recent articles about the use of IWBs in South Africa.

An IWB is a touch-sensitive board connected to a computer and digital projector (Salem, Salem & Kassim, 2015). The IWB enables users to gain access to any file or software saved on the computer by tapping on the board. The projector displays the computer screen on the board (Coyle, Yañez & Verdú, 2010). Teachers can access information from around the world with a computer connected to the internet. A wealth of resources is at the teacher's fingertips (Donnellon McCarthy Enterprises, 2018).

IWBs are widely invested in, used and researched, in education and business, especially in Australia (Erikson & Grant, 2007; Bennet & Lokyer, 2008; Kearney & Schuck, 2008; Verenikina, Wrona, Jones & Kervin, 2010; Shi, Yang, Yang & Liu, 2012; Maritz, Stephenson & Carter, 2017) Europe and specifically in the United Kingdom (Hall & Higgins, 2005; Kennewell, 2006; Morgan, 2010; Bidaki & Mobasheri, 2013; Kneen, 2015). Businesswire (2016) predicts that the use of the IWB in Europe will grow by 15% until 2020. The factors contributing to this growth are mainly as a result of the use of the IWB in online learning and the increasing demand for interactive learning. In South Africa, this technology is underutilised in schools.

This study wanted to find answers to the following research questions:

Main research question:

What contributes to teachers' acceptance and use of interactive white boards in their teaching practice?

Sub research questions:

1. How are teachers using interactive white boards?

2. What challenges do teachers face when using interactive white boards?

3. What advantages do teachers experience when using interactive white boards?

4. What training have teachers received on interactive whiteboard usage and how effective was the training?

5. How easy or useful is it for teachers to use interactive whiteboards?

6. What are the attitudes of teachers when using the interactive white board?

7. What support are teachers using IWBs receiving from the school management?

2. LITERATURE REVIEW

2.1 Introduction

In this literature review, the researcher will describe what an IWB is as well as how it can be used, then the advantages and disadvantages of IWBs will be discussed. To find the impact on the use and acceptance of the IWB in classrooms, this section will conclude with the technology acceptance model (TAM) as theoretical framework.

2.2 Uses of IWBs

From the teachers that have access to an IWB, most use IWBs for presentations, watching movies, animations and videos and playing educational games. Learners prefer using the

IWB for entertainment purposes, some use it for their own presentations or for visual activities (Saville, Beswick & Callingham, 2014).

Connection to the internet gives teachers access to a wealth of various resources. For example, teachers can use Google or YouTube. Teachers can create lessons by using photos, graphs, illustrations, maps or videos. Interactive whiteboard technology allows for the integration of various other technologies such as computers, microscopes, cameras and video cameras (Platinum Copier Solutions Team, 2017).

The teacher can centre the class on problem solving. S/he can present the class with a problem and then pass it to the students to solve. With the IWB technology, learners can better collaborate in the classroom (Donnellon McCarthy Enterprises, 2018).

2.3 Advantages of IWBs

According to Greiffenhagen (2000), the IWB is used as a presentation, interactive and communicative ICT tool. For example, the teacher can present a quiz on the IWB and learners must select the correct answer. Thereafter, the results are stored on the teacher's computer. Teachers find the IWB a flexible and versatile teaching tool. It is increasing their pedagogical skills as it is offering another teaching method. According to Betcher and Lee (2009) the use of the IWB improves learning processes and enables meaningful instruction especially with the integration between the teachers' pedagogy and the IWB's potential.

The IWB indicates a pedagogy that is still focused on the teacher. Gillen, Kleine-Staarman, Littleton, Mercer and Twiner (2007) noted that the teacher can prepare material ahead of time and then retrieve it immediately to be presented as needed. During the presentation items can be changed directly so that multi-faceted instruction can be created.

Teaching from the front of the class is a preferred pedagogic stance for most teachers. With the IWB teachers can continue using this position or also move to the back while the learners go to the front and interact with the contents and questions on the board. IWBs promote interactivity and facilitate more interactive lessons. The IWB enhances teacher-learner interaction and learner participation. The teacher is the mediator between the IWB and the learners' learning experience (Bidaki & Mobasheri, 2013). They can use open-ended questions and give learners time to think and as a result, learners can produce a higher quality discourse (Murcia & Sheffield, 2010).

Teachers like the feature of the IWB that can help to link lessons to each other. This saves class time and helps learners to remember the previous lessons. Another time saving feature is that teachers can save any page and use it again. The facility to move back and forth between pages on an IWB screen is a useful technique in supporting learner needs (Bidaki & Mobasheri, 2013).

Teachers noted that the use of the IWB allows them to prepare lesson plans with variety, contributing to meaningful changes from the traditional instructional methods (Bennett & Lockyer, 2008). As a presentation tool, the IWB suggests a varied and expressive type of instruction. The workloads of teachers are reduced because information can be saved and retrieved in a simple manner (Glover & Miller, 2001). Once a teacher creates many lessons, it is a good practice to organise them in courses. The teacher can organise lessons on a year-to-year or topic basis. The learners can then play back or review a lesson whenever they want

(Sznigir, 2019). Teachers can prepare lessons for more advanced learners or for those who need extra explanation (Sznigir, 2019).

Teachers claim that IWBs motivate learners; lessons are more stimulating, resulting in improved attention. Studies have shown that learners who learn with the IWB are more attentive, participate more actively and interact more with their teachers, classmates and the IWB (Higgins, Beauchamp & Miller, 2007). Learners like having fun using the IWBs and are interested in the multimedia and versatility associated with the IWBs (Smith, Higgins, Wall & Miller, 2005).

IWBs allow learners to develop 21st century skills such as higher order thinking, communication, cooperation, problem solving and technology usage skills (Manny-Ikan, Dagan, Berger-Tikochinski & Zorman, 2011). The IWB serves as the centre of attention, enhances cooperative learning and contributes to the development of autonomous learning and higher order thinking skills (Manny-Ikan *et al.,* 2011). IWBs are equipped with different functions and therefore support different teaching and learning styles (Beauchamp & Parkinson, 2005). IWBs integrate various learning styles into one experience. Learners can learn by seeing, hearing and interacting with the board through touch (Platinum Copier Solutions Team, 2017).

For learners of the digital age, who use technology 24/7, having an IWB in classrooms provides continuity. It gives them immediacy and they find the large colourful displays stimulating. They can find and structure information in new and creative ways (SMART, 2009).

One of the biggest benefits of introducing educational technology in the classroom, is the impact it can have on the environment. Switching to digital solutions reduces the amount of paper and improves the way study materials are reusable (Sznigir, 2019).

2.4 Disadvantages of using IWBs

Using an IWB demands some ICT skills and therefore proper training needs to be given before it can be used (Sznigir, 2019). Through the IWB, teachers have access to a huge amount of resources that may create confusion and it may be difficult for a teacher to choose the best resources in a short time. Another disadvantage is that it initially takes a lot of time to develop lesson plans with the use of the IWB in mind (Thomas & Schmid, 2010).

Teachers complain about technical problems (such as freezing and crashing), monitor brightness and sunlight when IWBs are used in the classrooms. They also need support with technical difficulties such as networking problems, no response from electronic pens, unresponsive images and a lack of signal immediately prior to and during lessons. Many teachers also report difficulties in the movement of the board or projector, especially when the board is not permanently fixed. This causes the calibration to be disturbed requiring realignment (Levy, 2002). Many teachers are inexperienced in setting up the equipment and in manipulating features on the board, leading to lesson disruption (Greiffenhagen, 2000).

A school may not have enough funds to provide an IWB for each classroom or there may be IWBs in classrooms that are not used or used as a normal whiteboard due to a lack of time to design teaching materials, limited software or due to frequent unsolved problems (Schmid, 2008).

When an IWB is utilised for teaching, problems will occur if teachers cannot manage the interactivity required by this approach. Training and personal development are therefore imperative to successful integration of the IWB into the curriculum (Glover & Miller, 2001).

Intensive teacher professional development to achieve high quality IWB usage is costly (Ferriter, 2010).

Teenagers are not as eager to leave their seats as younger learners (Thomas, 2003). The study by Gillen *et al*. (2007) suggests that learners lose attention when only one student in the classroom uses the IWB. Teachers also mentioned discipline problems when more than one learner wanted to use the IWB at the same time, or when learners accessed unauthorised materials at break time or listened to loud music (Alparslan & Ve Gcbay, 2017).

There is also a danger that the introduction of this expensive equipment is introduced because it is available, rather than because it is known to meet the professional needs of teachers and the educational needs of learners more effectively than other existing educational tools (Gillen *et al*., 2007). Earlier research on IWBs in schools has shown that a technology-led mode of instruction will create problems regarding teachers' take-up of the technology as a pedagogic tool (Dawes & Selwyn, 1999). The use of the IWB cannot claim to transform teaching if teachers use it to support a traditional style of teaching (Gillen *et al.,* 2007).

Moss, Jewitt, Levacic, Armstrong, Cardini and Castle (2007) note that, although IWBs symbolise a significant development that allows teachers to teach more effectively, it does not automatically provide instructional quality or an improved learning experience. Although teachers and learners generally are positive in their views of IWBs, this is not supported by evidence of increased student achievement (Smith *et al.*, 2005).

2.5 Theoretical framework: The technology acceptance model

The original technology acceptance model (TAM) was introduced by Davis (1989). The version that the researcher used in this study, is the first modified version (Davis, Bagozzi & Warshaw, 1989). It is a model that tries to explain and predict factors of an individual's behaviour towards a new system of technology (Liu, Liao & Pratt, 2009). The TAM model's main influence is on the use of computers and IT technology (Gong, Xu & Yu, 2004). The model is made up of two main beliefs for the use of technology namely; perceived usefulness and perceived ease of use (Liu, Liao & Pratt, 2009). Perceived usefulness can be defined as people who may or may not use technology in their belief that it may or may not help improve their job performance (Davis, 1989). Perceived ease of use, according to Davis (1989), is when people believe that the system can be used effortlessly. If the technology is easy to use, people will use it, while if it is not easy to use, they will not have a positive attitude towards using it. Even if people believe that the new technology presented to them may be useful, it may be too difficult to use and effort levels outweigh performance benefits.

TAM proposes a link between the external variables, users' perceived usefulness, perceived ease of use, attitude towards technology use, behavioural intention and actual use of technology. The main idea is that perceived usefulness and perceived ease of use together affect the users' behaviour towards the technology (Davis, 1989).

This framework was suitable for this study because it focused on all its components in the interview questions that were asked. The researcher found that the components had a direct effect on the teaching and learning process with IWBs.
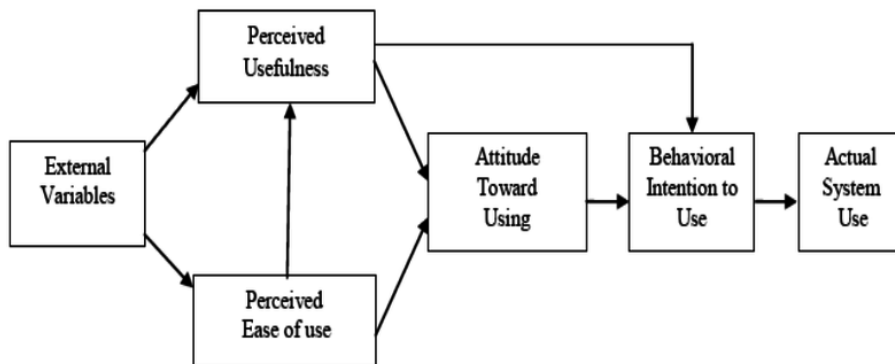
Figure 1: Technology acceptance model (Davis, 1989:985)

Oriji and Amadi (2016) also found in their research that it is necessary for teachers' attitudes towards the use of technology to change before it is implemented. Many teachers still believe that doing their job in the old way, is the best. Teo (2011) stated that teachers need to accept technology before they will implement it and before learners will benefit from it. Studies have found that the success of technology acceptance relies heavily on the attitudes of educators towards technology (Mahat, Jamsandekar & Nalavade, 2012). According to Mahat *et al.* (2012), a teacher's attitude and beliefs are important human factors that have a significant impact on the implementation of the technology in the classroom.

3. METHODOLOGY

This study aims at using qualitative methodology. De Vos (2011:36) states: "Qualitative research refers to inductive, holistic, emic, subjective and process-oriented methods used to understand, interpret, describe or develop a theory on a phenomenon or setting. In addition, it is a systematic, subjective approach used to describe life experiences and give them meaning". The researcher interacted with the participants; in the process, the participants unravelled their worlds and interpretations were made using qualitative procedures.

Furthermore, Bogdan and Biklen (1992) explain that a qualitative data collection method as a researcher paying attention to how things in a society have been naturally created or made, the deeper relations between content matter and what shapes the inquiry. They seek to respond to issues that relate to how social experience is created and given meaning (Denzin & Lincoln, 2011). The researcher visited the teachers in their natural settings and used qualitative research to "look through their eyes" (Nieuwenhuis, 2007:51) to gain an understanding of and description of their attitudes, views and beliefs regarding the use of IWBs in their teaching.

Golafshani (2003) states that, it is a kind of research that produces findings from the real world setting where a phenomenon of "interests unfolds naturally". Humans are natural story tellers and are socialised in societies surrounded by stories that give narrations of who we are and where we belong, beliefs and codes of ethics and principles (Bolton, 2006). Golafshani (2003), moreover states that in qualitative research, findings are arrived at without using statistics. "Qualitative research basically works towards the interpretation of meanings, emotions, behaviours and/or perceptions by analysing concrete cases in their temporal and local particularity and starting from people's expressions and activities in their local contexts"

(Flick, 2009:30). This study collected data using a qualitative research approach. The study considered the qualitative approach as it was more concerned with the meanings the teachers have constructed, the way in which they make sense of their worlds and the experiences they have (McMillan & Schumacher, 2010).

Case studies involve systematically gathering enough information about a person, social setting, event or group to allow the researcher to understand how it functions (Berg, 2001). Case study research is descriptive research that involves describing circumstances that occur in the present (Thomas, 2010). In this case study, the researcher described the use of the IWBs by the teachers involved.

Six primary schools (99 participants) and three secondary schools (30 participants) in Pretoria, Gauteng, were chosen conveniently (the researcher stays in Pretoria), purposefully (the teachers had to use IWBs) and voluntarily. The researcher asked permission from the principals to give paper-based questionnaires with open-ended questions to the teachers utilising this technology. Questionnaires were selected to be able to find more participants. If interviews were conducted, the number of participants would be a lot less. The researcher found one primary school and one secondary school that were fully equipped with interactive whiteboards. A capital outlay like this reveals the level of commitment of the school governing body.

The data were described verbatim. The researcher read the whole data set several times to obtain a whole picture of the teachers' use of, and attitudes revealed by, the data through the eyes of the participants. She omitted obvious redundancies and repetitions. Thereafter the data were divided into meaningful units. A manual content analysis was employed and the data were analysed according to the themes derived from the TAM and the literature review (Elliott & Timulak, 2005).

The first set of questions focused on external factors. Here the researcher concentrated on challenges and advantages of the IWB. The second theme was perceived usefulness and perceived ease of use. The third theme focused on the attitudes of the teachers and the learners. The fourth theme focused on the behavioural intention to use the technology and theme five on the actual use of the technology.

4. QUALITY CRITERIA

To ensure the trustworthiness of this study, credibility, transferability, confirmability, and dependability were implemented. Credibility can be defined as whether the research findings are a correct interpretation of the participants' original views (Moser & Korstjens, 2018). To ensure credibility in this study, the researcher used the participants' words in the exact way they were written down.

Transferability explains the degree to which the results of qualitative research "can be transferred to other contexts or settings with different respondents" (Moser & Korstjens, 2018:121). In order to increase transferability in this study, the researcher described the participants' context and experiences in order to become meaningful to an outsider.

Confirmability is the degree to which the findings of the research study could be confirmed by other researchers (Moser & Korstjens, 2018). The findings in this research study are already confirmed by more than one author. Dependability is "demonstrated through the participants' evaluation of the findings, interpretation and recommendations of the study that

are all supported by the data as received from participants of the study" (Moser & Korstjens, 2018:122). To ensure the dependability for this study, an audit trail was kept with complete sets of notes on judgements made during the inquiry process that will be shared with interested participants.

5. ETHICAL CONSIDERATIONS

For this research, permission from the Gauteng Department of Education was obtained. In addition, ethical clearance from the University of Pretoria was obtained for the researcher to proceed with this study. As part of the ethical considerations, the principals and teachers were fully informed of the questions, how the data will be used and the results thereof. Participants were provided with a consent letter stating their rights as well as the right to withdraw at any point from the research. The questionnaires were filled in anonymously. The researcher referred to the participants as P to protect their identity during this study and the schools as P (primary) and S (secondary) school.

6. FINDINGS

6.1 Introduction

The teachers' use of the IWBs varied between one and eleven years, averaging approximately five years. Most of them do not use any other technology. Those that do use other technology, use cameras, TV projectors, laptops, tablets, iPads, smart phones, visualisers, CD or DVD players or radios. Software used are Hot Potatoes, YouTube, Prezi, Quizlet, Mimio, Geogebra, Free Class, Easitech, Classdojo, etc.. Some teachers also use Moodle as a learning management system.

6.2 External factors

6.2.1 Biggest challenges[1]

Time

Most teachers are used to the blackboard and it takes time to get used to the IWB. According to two secondary school teachers and six primary school teachers it takes a lot of time to set up the board and the computer. It also takes time to get to know the program to be able to use it more effectively. It takes a lot of time to prepare a lesson, specifically interactive lessons.

> P2-P6:   *"To set it up can take time."*
>
> P4-P8:   *"Sometimes technical glitches occur and it can waste a lot of time."*

Limited knowledge

> *Some participants are of the opinion that their lack of knowledge causes them not to use the IWB to its full potential. It is difficult to remember how everything works. One teacher acknowledged that she sometimes forgets some of the functions of the board. S1-P6:   "I am still getting used to some features."*
>
> P3-P5:   *"My personal lack of knowledge."*
>
> P6-P23:   *"I am not a techno boffin, learning slowly".*
>
> P6-P1:   *"Getting to know the program thoroughly to use it more effectively."*

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1   The first P stands for Primary school and the second for Participant. The S stands for Secondary school

Preparation

It takes a lot of time to prepare a lesson, specifically interactive lessons. Some teachers do not have enough expertise.

> S2-P4: *"It is taking time and effort to plan interactive lessons".*

Problems with the board

Fourteen secondary school teachers and 39 primary school teachers mention problems with the IWB.

> P6-P22: *"The alignment of the screen is often reset daily which is frustrating".*
>
> P4-P11: *"If something does not work – struggling to log in, the light bulb not working."*
>
> P4-P5: *"The pen writes too thick". "The battery in the pen goes flat".*
>
> P3-P2: *"The pen does not write where you want it to write, even after you calibrated the board".*
>
> P2-P9: *"Sometimes the projector's volume is not of a good quality".*
>
> S1-P1: *"Navigating, acquiring and updating the relevant software, to renew the licence for the software".*
>
> S1-P3: *"The blinds in my class do not block out the sun, so learners find it difficult to see on the board".*
>
> S3-P2: *"Some learners with visual problems battle to see words on the board".*

Challenges with learners

Only one learner at a time can come forward and use the board while the rest of the class just observe. Five secondary school teachers and three primary school teachers said that many learners are not paying attention when the teacher is busy on the board.

Internet connection and electricity interruptions

Two secondary school teachers and 19 primary school teachers have problems with the internet connection. One secondary and 27 primary school teachers report problems with electricity interruptions. This is unfortunately a reality in South Africa and most teachers do not have a plan B ready if load shedding is implemented.

Training

Teachers need training to use the IWB, but five secondary school teachers and 22 primary school teachers reported that they had not received any training. Three secondary school teachers and 44 primary school teachers indicated that they received basic training and that the training was not enough; it was very quick; a beginner's course or just a handout. Most teachers ask for help from colleagues or the HOD if it is needed.

Support from school management

Many teachers did not give any comments when asked what support they received from school management. Three secondary school teachers and 12 primary school teachers reported that they had not received any support. Some also commented that the management has no idea about what is happening in their classes.

6.2.2 Advantages

Advantages concerning the IWB

Thirteen secondary school teachers and 31 primary school teachers describe the IWB as user friendly. The IWB is clean when you use it, unlike chalk that makes everything dirty. It saves paper and lots of interesting software exists.

> P5-P7:   "The board is interactive and the displays colourful and visually stimulating."

Advantages concerning learners

This type of learning is imperative for the current young generation. Learners like the pictures and real-life videos. This is the type of technology that they grow up with. Three secondary school teachers and 15 primary school teachers are very impressed with the visual learning. Demonstrations are very effective. Learners find it interesting and fun. They are much more observant when they learn interactively. They are excited when the teacher allows them to write on the board. Learners understand much better and they participate fully. The learning process is enhanced and it helps to make lessons interactive and makes lesson delivery easy and effective. It keeps the learners entertained and is more interesting than a textbook. They can leave their textbooks at home, their school bags are lighter and there is more space in class. Learners concentrate better in class. Learners get a modern education with unlimited resources. According to two secondary teachers and 13 primary school teachers, learners are more active, interested and they concentrate better.

> P2-P8:   "Visual learning for visual learners."
>
> P6-P34:   "Technology that kids can identify with."

Advantages concerning teachers

The teacher gets immediate feedback if the learners understand or not. The teacher can save changes that he / she made and continue where the previous lesson ended. It is easier to clear the board for the next lesson and easy to adjust the lesson to classes. It saves time and there is an electronic record of your lessons. Lessons take a very long time to prepare, but then it can be stored for further use. Teachers are able to present more creative lessons. If they want to re-explain, it is easy to go back, pause and in this way ensure that learners grasp the content. There is less pressure on the teacher if he / she does proper initial preparation. Teachers are of the opinion that PowerPoints, videos, pictures and demonstrations are good resources. The presentation is the same for all classes. Content can be sourced from the internet and the possibilities are numerous. Teaching is moving into the technological era.

Training

Six secondary school teachers and 48 primary school teachers are satisfied with the training they received and indicate that it was in-depth.

Support from management

Three secondary school teachers and 14 primary school teachers commented that they receive 100% support from school management. Sixteen primary school teachers indicate that it was enough or that they received the equipment. Two secondary school teachers mention that a technical team is available for support. Three secondary school teachers and 15 primary school teachers mention that the management motivates them. Seven primary

school teachers mention funds that are available for anything needed. Others mention that their more technologically inclined colleagues are always available if they need help.

6.3 Perceived usefulness and perceived ease of use

Teachers' attitudes are affected by how easy and useful they find the IWBs to use.

6.3.1 Perceived usefulness

Eleven secondary school teachers and 65 primary school teachers find the IWB very useful or effective, mainly because they can save their work and do not have to rewrite it as opposed to when they used the blackboard. Teachers are of the opinion that the IWB ensures that their classes are creative and interesting. They find the IWB effective for enriching work and useful to do group discussions. Six secondary school teachers and 27 primary school teachers commented that they cannot function without an IWB. They use the IWB daily for all subjects. Teachers are of the opinion that the IWB reduces their workload. Learners are visually inclined and follow better if the work is displayed on the IWB. They are more interested in the work. For most of the teachers, the IWB changed the way that they work.

6.3.2 Perceived ease of use

Teachers have different opinions about the perceived ease of use. Thirteen secondary school and 77 primary school teachers agree that it is easy if you know how to use it and if you received training in its use. It is initially challenging until you get used to it. Teachers' main problems are the calibration, the pen, internet access and electricity interruptions. Conversely, is the presentation, motivation, and learners' enjoyment in learning this way.

> P2-P3:   *"I struggled in the beginning, but I have been on two training sessions which were very beneficial."*

> S1-P7:   *"I am fortunate to be tech savvy and enjoy enhancing my lesson through the use of technology."*

6.4 Teachers' and learners' attitudes towards the IWB

6.4.1 Teachers' attitudes

Forty-two per cent of secondary school teachers and 65% of primary school teachers indicate that they are very positive. Other comments include: "I am mad about it", "I like it a lot", "User friendly", "I use it daily", "I cannot survive without it", "I appreciate it", "It makes my teaching easier", "We have to adapt with the time".

> P6-P34:   *"I am inclined towards using new technology to improve."*

> P5-P11:   *"It is a major part of my teaching and I love it!"*

> P3-P9:   *"It helps to make lessons creative and fun."*

> P2-P14:   *"It makes teaching my subject easier and creates room for interaction."*

> S2-P6:   *"It was daunting at first, but now I love it."*

> S3-P4:   *"It has a place in teaching and learning, but it does not replace hard work and good teaching practices."*

Twenty-three per cent of secondary teachers and 12% of primary school teachers indicate that they feel negative towards the technology. Some see it as time consuming. For some it is challenging and even inconvenient. Many of these teachers prefer old school teaching.

6.4.2 Learners' attitudes

Three secondary school teachers and 27 primary school teachers indicated that the learners enjoy the IWB classes, while eight secondary school teachers and 29 primary school teachers said that learners are very positive. Other comments are: "Excited", "Love it", "Mad about it", "Fun", "More focused", "Impressed", "Motivated", "Understand the work better". Some teachers said that it differs from learner to learner. Learners are mostly positive, but some misuse it and some are indifferent.

6.5 Behavioural intention to use technology

6.5.1 Factors that will influence you to use the IWB or not

Positive attitudes lead to the behavioural intention to use the technology. Teachers were asked which factors will influence them to use the IWB. Examples of positive comments are as follows:

> S1-P1, P5-P10, P5-P16: "Nothing will keep me from using it."
>
> P6-P5, P6-P6, P6-P9, P6-P10, P6-P12, P6-P13: "More prepared lessons."
>
> P5-P22, P6-P50: "If it was not user friendly".
>
> S3-P6, P2-P1, P5-P14, P6-P32, P6-P44: "It saves a lot of time".
>
> P2, P6-P28: "Learners are more visually inclined".
>
> P5-P1: "It makes my teaching interesting".
>
> P6-P29: "If you have to use the same lesson over and over, you can just save it".
>
> P5-P13: "Good software is needed".
>
> P6-P40: "Learners can see easily because the image can be expanded".

Some negative comments were also found. The teachers were mostly worried about the lack of internet, electricity interruptions, technical problems, too little time for teaching, training and software that needs to be updated.

6.5.2 How lesson planning and preparation changed since the use of the IWB

Only five teachers stated that nothing changed. Eight primary school teachers said it became easier. One secondary school teacher and two primary school teachers are of the opinion that you need less preparation, because lessons can be saved. Lessons are more user friendly. One secondary school teacher and six primary school teachers are using more PowerPoints. Ten primary school teachers are of the opinion that lessons are more effective, interactive and creative. Nine primary school teachers say that lessons are more visual, three say it is more fun and two say that their lessons are becoming better each year. Only four teachers mentioned negative aspects:

> S2-P6:   "Planning takes longer."
>
> P1-P2:   "It is a lot more work."
>
> P4-P42:   "I had to update my lessons, some I had to redo."
>
> P6-P6:   "I just wish I had more time".

6.6 Actual system use

When asked what teachers allow the learners to do with the IWB, different opinions came to the fore. They can answer questions, complete diagrams, write on the board during lessons, do examples of exercises, do calculations, do presentations, play interactive spelling and Maths games and make mind maps for study purposes. P1-P29: "If I do not understand something, I ask them to show me".

Unfortunately, some teachers also reacted by saying:

S1-P3:	*"There is no time for them to use it."*

S2-P7:	*"Nothing. In grade 12 there is no time to play."*

P6-P20:	*"Minimal, due to fear of breaking or scratching the board as repair or replacement is very expensive."*

P6-P43:	*"They are not allowed to touch / write on it."*

When asked how they use IWBs in their classes, teachers replied: "To show PowerPoint presentations (5S, 15P), showing videos (4S, 30P), pictures (1S, 12P), mind maps (2S, 5P), explanations (11P), games (9P) showing graphs, recording lessons, complete quizzes, mind mapping, cross word building, projects, highlighting, marking, and writing on the board, introducing and consolidation of new topics, providing visuals, enhancing teaching and understanding through the use of multi-media".

P6-P19:	*"For visuals so that kids can see what they hear and understand it better".*

P5-P11:	*"On a daily basis as a main teaching medium".*

S2-P3:	*"To encourage learners to participate in lessons. I also use it with I-pads, then learners' answers show on the board".*

## 7.	RESULTS

Many teachers find the IWB technology extremely useful and cannot imagine teaching without it. It seems to reduce their workload. It seems as if the technology, after initial hard work, lowers the teacher's workload. The lessons can be stored and reused. Teachers are of the opinion that teaching is now more creative and interesting, and that traditional teaching changed (Bennet & Lockyer, 2008). Most find the technology easy to use. Some struggled in the beginning or are still struggling and are merely using the IWB as a whiteboard (Šumak, Pušnik, Heričko & Šorgo, 2017; Chen, Gamble, Lee & Fu, 2020). Most use the IWB for PowerPoint presentations, videos, mind maps, project worksheets or interactive games.

The main challenges encountered are the calibration of the IWB, the light bulb not working, the Internet being offline, electricity interruptions, the pen that does not work, it is time consuming to set up, updating of the software, the sun shining on the screen and teachers' personal lack of knowledge and lack of training (Levy, 2002).

From the responses, benefits for visual leaners are clear. Because the IWB is connected to the internet, teachers use YouTube videos, pictures in their lessons, graphs, mind maps, etc. This stimulates learning for the visual learners. Therefore, teachers see the IWB as an advantage for today's learners as they are technology literate and appreciate visual material (Bakadam & Asiri, 2012)

Learners' attitudes are generally very positive and they are excited and amazed about the technology. The teachers enjoy using it, are excited or just love it. They are eager to learn more. Regarding attitudes, various studies such as Lai (2010), Matthews-Aydinli and Elaziz (2010), Xu and Moloney (2011), Bakadam and Asiri (2012) and Alshaikhi (2017) have found positive teachers' attitudes towards working with IWBs. In the same line, the results of a study by Morgan (2008), Duran and Cruz (2011) and Zengin, Kırılmazkaya and Keçeci (2011) showed that learners were more motivated and enjoyed lessons in which IWBs were employed as these lessons were more interesting and exciting.

Most teachers allow the learners to write on the board, do examples of exercises or calculations, play interactive games, use mind maps or do group presentations. Some do not allow learners to use the board at all, because of a lack of time or because they are afraid that the learners will scratch the board or break something.

Many teachers think that they had adequate training, but others indicated that it was brief and basic without any follow up. Training is definitely a matter that needs more attention (Ferriter, 2010; Šumak, Pušnik, Heričko & Šorgo, 2017). Although many indicated adequate support by management, this differs from school to school. Teachers also indicated that they learn most form their fellow educators.

It would appear from the number of questionnaires that have been returned, and the relevant comments made, that primary school teachers use IWBs more often and more efficiently than high school teachers. Primary school learners are also keener to write on the IWB than high school learners, who are reluctant to leave their desks.

8. LIMITATIONS OF THE STUDY

This study only employed questionnaires as a data analysis method, thus results cannot be triangulated. Only urban schools in Pretoria, Gauteng, were considered and only teachers that already use IWBs were asked to participate. Results cannot be generalised to other contexts.

9. RECOMMENDATIONS

The research indicated that IWBs offer many benefits to teachers and schools and whether it is worthwhile investing in the technology.

1) Suppliers of IWBs should do demonstrations at schools to showcase the usefulness of the technology.

2) Principals of schools should appoint teams to do research to determine the schools' specific needs, as the types of technology and prices differ hugely.

3) The school governing bodies need to budget for the expense at the beginning of the financial year.

4) The use of the technology can be phased in, starting at grade twelve in secondary schools and grade seven in primary schools. If schools do not have a lot of money available, it would be worthwhile buying one IWB that can be used by different classes. Schools need to approach the community and large companies for contributions.

5) Suppliers should provide in-depth training and teachers should also know how to use the board interactively. Schools need to appoint at least one technical assistant that can help with daily challenges such as the calibration of the board, pens and globes not working. The board must be installed at a height accessible to most children. The school governing

body also needs to budget for window shades in classes that have IWBs to prevent the sunlight from blinding the image.

6) Other items that must be budgeted for, are the correct software as well as licences for software and the necessary upgrades and maintenance.

When you listen to teachers being proud of this technology in their schools and using it to its utmost potential, it can be regarded as an asset that would enrich more schools.

10. CONCLUSION

The research indicated the benefits of using IWB and therefore, more teachers should be encouraged to use the IWB regularly. For instance, the use of the IWB, when accompanied by adequate training on how to use the board interactively, will have positive impacts on learners. Learners must also be invited to work with the technology. However, for successful implementation of IWBs, schools need to rethink technical support strategies for teachers. The true success of IWBs lies in how teachers learn to incorporate it in their learning content and if they use the IWB interactively. This research indicated that teachers who participated in this study have positive attitudes about the usefulness and ease of the use of IWBs and this influenced their attitude to ultimately use the IWB. Many teachers mentioned higher learner motivation and found that the IWB helped them to diversify their teaching approach and enabled more effective teaching, subject to there being no technical problems.

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