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LEADING LEARNING IN PAPERLESS CLASSROOMS: EXPERIENCES OF LEADERS AND TEACHERS

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A B S T R A C T

Through a qualitative case study research methodology, this study investigated the experiences of school leaders and teachers as they made the shift to paperless classrooms in the Ekurhuleni district. Semi-structured interviews with participants who had been purposefully selected were used to gather the data, which was then thematically analyzed. The results showed that using digital resources gave students more time to interact with the material and allowed for more efficient and effective communication, which eliminated the drawbacks of using a traditional classroom. It was a preferred choice from the perspective of leaders of learning. However, it did also pose some challenges, including a lack of technical assistance, security concerns, a slow and uneven deployment of resources, and a lack of opportunities for continued teacher development through formal and on-the-job Continuous Professional Development (CPD). The study recommends the inclusion of digital resources as tools that facilitate the enhancement of teaching and learning rather than simply changing the face of traditional classrooms. As a result of the global Covid-19 outbreak, time and access were severely restricted. Consequently, because only a small percentage of the staff at the two research sites participated due to infection or comorbidities, the study cannot be generalized to all situations. Recommendations for further study, including observing teachers and students. Successful implementation could be aided by the development of pedagogical experiments through action research, as well as input from other important stakeholders. In this research project, I explored the experiences of leaders of learning and teachers in two schools in Ekurhuleni since I teach at one of the schools participating in the "paperless classroom" program.

A R T I C L E I N F O

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1. INTRODUCTION

The phrase "paperless" proposed a digitized classroom where computers, smart boards, tablets, and smart phones would be used, instead of using paper-based notebooks or textbooks for instruction and learning, (Mpungose, 2020; Shonfeld & Meishar-Tal, 2017). The primary objective of such a program was to restructure the present educational landscape to emphasize the development of 21st-century skills so that students would be equipped to engage in the fast-developing and evolving digital age, (Maphalala et al., 2022; Alfreds, 2016). Leaders in learning (Principals and their School Management Teams - SMTs) were assigned the task of bridging the digital divide while also engaging in innovative pedagogical designs that prepared teachers for this innovative learning environment (ILE), therefore disrupting the traditional learning ecology that teachers and students alike were accustomed to. Although this attempt is to be applauded, the "crossover" of providing schools with just

digital resources was ill-advised. The teaching and learning process as a whole needed to be redesigned, not just access to digital resources. Leaders of learning weren't equipped for the assignment, and neither were their teachers. According to a five-year assessment, the execution of the project appears to be far from the intended goal, despite the availability of some of the anticipated digital resources. The paperless initiative is "grappling with many teething problems" (Gedye, 2016, p.1)

Ten years ago the Gauteng Department of Education (GDE) set out to ensure that students and educators in public schools were exposed to and equipped with Information Communication Technology (ICT) capabilities. The Gauteng Online Schools Project (GOSP) or better known as Gauteng Online initiative was launched by the GDE in an effort to carry out this objective. According to Waspe (2013), this futuristic plan aimed to integrate e-learning by integrating ICT in teaching and learning. To accomplish this, a safe location with 25 desk-top computers, broadband Internet access, email capabilities, and other digital tools for curriculum delivery was to be made available to all schools. At its inception the GOSP was reported as being the largest ICT initiative embarked on in the province, with over three billion rands invested in this venture (ITWeb, 2011), this initiative was empowered by the vision of the Department of Education (DoE) which was to ensure that every learner would be exposed to the use of the computers and have internet access.

In 2014, the "paperless classroom" project entered its pilot phase. A 17-billion-rand budget was allocated for the entire project and seven Ekurhuleni-based schools were included (Pilane, 2015). As a result of the government's recognition of the potential of ICT to improve education and training in South Africa, a variety of stakeholders committed to a substantial amount of time, effort, and money every year to integrating ICT into teaching and learning (Lazarov, 2018; van Niekerk & Blignaut, 2014; Department of Education, 2004). Before the digital equipment was installed, the Matthew Goniwe School of Leadership and Governance hosted workshops to help teachers get ready. The sessions were designed to help educators improve their ICT abilities and gain practical experience using the latest technology. Teachers and schools were also given technical support during the pilot project phase (Ferri et al., 2020; Mthintso, 2018).

Digital proficiency is now a prerequisite for participation in the Fourth Industrial Revolution (4IR), a global revolution in which all citizens must be involved. Schwab (2017) asserts that this industrial revolution portends a time of radical digitization, artificial intelligence, advanced robotics, 3D printing, and the Internet of Things. Classrooms of the future, also known as "paperless classrooms", introduce e-learning (Msila, 2015) as one strategy to modernize and digitize conventional classrooms in order to facilitate the development of 21st-century capabilities (Wang, 2010).

Because of South Africa's oppressive background, the modern educational system is committed to providing high-quality education to promote civil expansion and fiscal progress (DoE, 2004). The Department of Basic Education (DBE) has therefore worked to integrate ICT into public schools, as was mentioned above. Unfortunately, there have been several implementation-related difficulties in addition to these advances. While the current Covid-19 pandemic compels a shift to virtual classrooms, the question that needs to be addressed is: will South Africa be prepared to make the switch if the lockdown lasts longer?

This study examines the experiences of leaders and teachers who are attempting to lead learning in "paperless classrooms" through the lens of the aforementioned difficulties and the experienced global Covid-19 pandemic because their insights could inform and improve how ICT integration is planned for and carried out, both now and in the future. In this regard, the research questions which guided this study: What are the experiences of leaders and teachers who are leading learning in paperless classrooms? How do school leaders and teachers in Ekurhuleni describe a paperless classroom? How does leading learning in Ekurhuleni's paperless classroom differ to the traditional classroom from the perspective of school leaders and teachers? What are the benefits experienced by leaders and teachers in implementing the paperless initiative in the classrooms of Ekurhuleni?

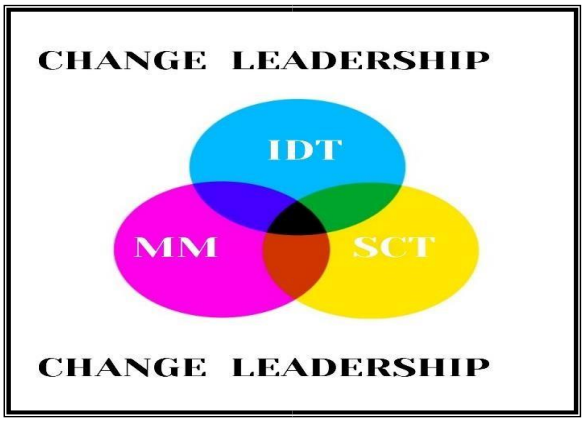
2. THEORETICAL FRAMEWORK

Technology Acceptance Models (TAM)

Numerous Technology Acceptance Models (TAMs) might be applicable to the subject of this study. These models are used to determine how people use new technology as well as how they comprehend and accept it. Ten TAM theories are compared by Moumani, Jamous, and Hilles (2017) by examining their composition, stages of evolution, and strengths and shortcomings. They come to the conclusion that no one theory is definitive, but they all offer a framework for coping with technological change through an examination of specific ideas from the behavioral sciences, psychology, and sociology. However, for the purposes of this study, an intersection between three TAM theories, Innovation Diffusion Theory (IDT by Rogers,1983), Motivational Model Theory

(MM by Deci & Ryan,1985), and Social Cognitive Theory (SCT by Bandura,1986) is considered through the lens of a transformational leadership style, or what Abu-Nahleh (2014) describes as "change leadership". See Figure 1 below.

Figure 1: The intersection of IDT, MM and SCT within the context of change leadership



Innovation Diffusion Theory (IDT)

The Innovation Dynamics Theory (IDT), created by Rogers in 1962, is one of the earliest social science theories to investigate innovation (Tornatzky & Klein, 1982). This notion emerged from several diffusion studies that concentrated on the individual differences in accepting innovation. The process through which an idea spreads over time among members of a social system (the school community) is known as diffusion. According to Rogers (1983), five innovation traits have an impact on behavior and help to explain how quickly innovations are adopted. These five traits include, (1) relative advantage, (2) compatibility, (3) complexity, (4) trial-ability, and (5) observability (Rogers, 1983).

Motivation Model (MM)

Psychology gave rise to the theory of motivation. Extrinsic motivation and intrinsic motivation are its two main components. It stands for how the social environment affects motivated behavior. In contrast to intrinsic motivation, which is the perception of satisfaction from using technology, extrinsic motivation is the perceived usefulness of using technology (Chisango et al., 2020). They observe a connection between utility and enjoyment. When information systems are viewed as more useful, enjoyment has a significant impact on intentions, which increases the acceptance of useful systems while having less of an impact on the acceptance of useless systems (Denning & Lewis, 2020; Davis et al., 1992).

Social Cognitive Theory (SCT)

Bandura created SCT in 1986, and it has since grown to be one of the most influential theories of human behavior (Bandura, 1989). Social influence and its impact on both internal and external social reinforcement are the main characteristics of SCT. SCT also takes into consideration a person's prior experiences. Regardless of whether an individual engages in a certain behavior or not, these prior experiences influence reinforcements and expectations, and they also reveal the motivations behind that behavior. According to SCT, past experiences influence how people anticipate things will turn out when they engage in particular behaviors. In the context of computer usage, a modified version of SCT was developed as a consequence of a study by Compeau and Higgins (1995). They extended it to a model for acceptance and use of information technology in order to measure the self-efficacy and its impact on behavior. There are three distinct characteristics of self-efficacy, but they are interdependent: magnitude, strength, and generalizability. Furthermore, they identify three main constructs of usage behavior, namely outcome expectations, emotional reactions to computers, and self-efficacy (Compeau et al., 1999). Outcome expectations can be divided into performance outcome expectations and personal outcome expectations, as well as emotional reactions to computers (such as anxiety).

Transformational (Change) Leadership

According to this study, TAM and transformational leadership interact when it comes to teacher and learner attitudes toward the development of technological knowledge and abilities. The leadership literature has researched transformational leadership traits in great detail (Judge & Piccolo, 2004). It shows the leader's individual consideration, charm, intellectual stimulation, and inspirational motivation—four unique traits (Judge

& Piccolo, 2004). When working together as an organization, the two sides in a leader-subordinate relationship trade resources. Depending on whether aspects of interpersonal interactions were dominant, the nature of such a relationship would change. Transformational leadership qualities are distinguished by bi-directional information exchange, the leader's personal attractiveness, the leader's ability to intellectually challenge subordinates, and the leader's consideration given to individual concerns. Hence the influence of change leadership is an imperative for technology acceptance and as a stimulus towards a change in behavior.

3. RESEARCH METHODOLOGY

The paradigmatic lens with an interpretivist approach is used in this investigation. The interpretivist paradigm illustrates the creation of knowledge. As a result, knowledge-building is seen as a socially constructed, autonomous process (Creswell & Poth, 2013). The qualitative technique was most appropriate for this assignment since, according to the interpretive paradigm, the crucial goal of the study was to generate insight and in-depth knowledge through the experiences of the participants. A collective case research design was used in this study. The utilization of two case studies was intended to provide insights into the experiences of teachers and leaders, which served as the driving force behind this strategy.

Research site and participant selection

The district was selected owing to the fact that it falls into the catchment area where the paperless policy was piloted. The two schools were selected as the research sites due to their different academic performance. Schools A and B were both established in 1899 and serve the same township in Ekurhuleni South. School A has recently been performing slightly lower than School B. The staff capacity of School A comprises 77 educators while School B has 67 educators. Learner enrolment in the former was 2 372 with an average of 45-58 learner per class, while the latter learner enrolment was 2 035 with a class capacity of about 40-45 learners in a class.

The study explored the experiences of school leaders and teachers in leading learning within the paperless classrooms of Ekurhuleni. Purposive sampling was used to identify informants that could best provide responses to the research questions owing to the exploratory nature of this research. Klenke (2008) asserts that purposive sampling is typically related to qualitative research. Hence, from each of the research sites, a sample of staff who were identified as leaders of learning were purposefully selected as participants in this study. The participants were purposefully selected on the premise that they had been working or teaching at the research sites for a minimum of four years following the establishment of the "paperless classroom" initiative and had extensive knowledge of the program's commencement. Table 1 provides the biographical details of the participants of this study.

Table 1: Biographical details of the participants

Participants	Gender	Age	Highest qualification	ICT proficiency	Teaching experience	Responsibility	Research Site
Principal D	Male	60	B. Ed.	none	31 years	Principal	Site A
Deputy M	Female	52	Honors'	Good	28 years	Deputy Principal-Curriculum	Site B
Deputy G	Male	55	B.Ed.	Good	24 years	Deputy Principal – Disciplinary LTSM Coordinator	Site B
HOD M	Female	50	Masters	Excellent	26 years	Head of Department – English ICT Coordinator	Site A
HOD B	Male	48	B.Ed.	Good	21 years	Head of Department - Humanities	Site B
Teacher T	Female	32	Honors'	Excellent	5 years	Post Level 1 teacher	Site B
Teacher R	Female	32	PGCE	Excellent	9 years	Post Level 1 teacher	Site A
Teacher S	Female	26	B.Ed.	Excellent	4 years	Post Level 1 teacher	Site B
Teacher C	Male	42	Masters	Excellent	9 years	Post Level 1 teacher	Site A

Teacher SN	Male	36	B.Ed.	Excellent	5 years	Post Level 1 teacher ICT Coordinator	Site B
Teacher M	Female	37	Honors'	Excellent	9 years	Post Level 1 teacher	Site A
Teacher K	Female	33	Honors'	Excellent	5 years	Post Level 1 teacher ICT committee member	Site B

Note: The participants (Table 1) were purposefully selected based on the premise that they have been working or teaching in the research site for a minimum of four years since the "paperless" implementation.

Data generation and research instruments

"Gathering information by administering instruments through asking people questions or observing their behaviors" is how Creswell (2012, p. 618) describes the data-generating method. In this study, qualitative surveys, semi-structured interviews, and document analysis were the research tools employed.

The ICT coordinator's file was made available upon request for materials pertaining to the "paperless" classroom. The file contents revealed correspondence between the schools, Ekurhuleni South District, and the Department of Basic Education (DBE). letters from the school addressing maintenance problems and a lack of ICT equipment. The file contained the school's information technology policy, White Paper 7's ICT policy, an implementation and rollout plan for ICT, delivery notes, asset lists for the equipment, and audit registers. These documents were analyzed in relation to the research questions in this study. Also, semi-structured interviews were conducted telephonically. The interviews were audio recorded and transcribed.

Data analysis

According to Creswell (2012), data analysis is crucial because it offers a greater understanding of participants' perspectives and reactions. Additionally, through data analysis, the investigator electronically saves, processes, codes, and organizes the data into thematic patterns. According to Creswell (2012), data analysis happens after the data have been gathered through the audio recordings of the semi-structured interviews. The goal of this study's thematic analysis was to condense the vast amount of transcribed data and data obtained from the qualitative survey into manageable themes for simpler analysis.

Trustworthiness

McMillan and Schumacher (2010) posit that a qualitative research study's trustworthiness is determined by the methods and procedures used in data collecting and interpretation to assure its confirmability, dependability, credibility, and transferability.

Credibility

Connelly (2016) outlines the pertinent methods used in the assessment of credibility, which may or may not include extended participant engagement, member-checking, iterative data querying, and triangulation. The triangulation technique was used in the study to confirm the validity of the data.

Confirmability

According to Houghton et al., (2013), confirmability refers to both the accuracy of the data and the researcher's capacity for critical reflection. Reflexivity was encouraged during the data collection procedure to maintain confirmability. When describing the participants' opinions and experiences in the research report, quote marks were used to provide a clear separation between the researcher voice and participant voice.

Transferability

The degree to which the research findings are adaptable and relevant to other locations, various contexts, and circumstances by providing a detailed description of the findings is referred to as the nature of transferability (Connelly, 2016; Frey, 2018; Klenke, 2008). With the use of detailed descriptions of the research locations' environments and the participants' biographies, transferability was established. In order to have a clearer understanding of the experiences of school leaders and teachers guiding learning in the paperless classrooms of Ekurhuleni, more probing during the interviews was made possible by data collection tools like a qualitative survey. Additionally, as a means of data triangulation, the document analysis procedure confirmed participant responses. Dependability

Dependability refers to the consistency of the research findings as well as their capacity to be replicated in related contexts (Butler-Kisber, 2018). Triangulation is a strategy that is associated with reliability in qualitative research. Multiple data-gathering techniques are used in triangulation, which conveys dependability by acting as indications throughout the investigation (Frey, 2018). For the purposes of this research, I adopted an inquiry audit of my research. In order to do this, I had to enlist the help of others who are more knowledgeable than I am, including my supervisor, who corrected and improved the research instruments before they were used to assess their dependability. A pilot study was conducted using the qualitative survey and semi-structured interviews respectively in order to examine the competence of the questions posed and to correct any insufficiencies of the research instruments.

Ethical considerations

Ethics refers to the practice of directing a research project in a way that demonstrates accountability and morally righteous behavior. Furthermore, it necessitates that the researcher respects the human dignity of the research participants and consider how the research may affect them (Gray, 2013). According to Creswell (2012), a researcher is required to take into account all necessary ethical factors, including participant privacy, informed consent, participant consent, maintaining participant's confidentiality and anonymity, avoiding deception, and data storage. The study complied with the Higher Degree Committee's code of academic conduct for the Faculty of Education at the University of Johannesburg. The Research Ethics Committee of the Faculty of Education at the University of Johannesburg then granted clearance certification. To request authorization to carry out research in the province of Gauteng, the Department of Education was also approached by email. Permission was sought after consulting the two school principals. Participants chose to participate voluntarily. Additionally, participants were told they could leave the research at any time without repercussions. Additionally, prior to the interview sections, the interviewees gave their free and informed consent.

4. FINDINGS AND DISCUSSION

Table 2: Themes and sub-themes derived from and analysis of the data

Themes	Sub-theme	% response
1. Conceptualizations of a paperless classroom	1. Digital resources	100%
	2. Reduction of paper-based activities	(79%)
2. Comparing Paperless with traditional classrooms	1. Teaching tools	100%
	2. Convenience	100%
	3. Active learning and increased learner interaction	42%
	4. Content delivery	37%
	5. Classroom aesthetics	16%
	6. Classrooms security	-
	7. Learning remotely	11%
3. Merits of the paperless classroom initiative	1. Improved technological pedagogical knowledge	
	2. Effective learner assessment and rapid feedback	63%
	3. Improve productivity and proficiency	31%
	4. Digital fluency for global competitiveness	63%
	5. Accessibility of information from multiple sources	32%
	6. ICT enriched interaction	16%
		31%

The themes and sub-themes are discussed and corroborated by direct quotations from participants. In the discussion, the findings are further analyzed and interpreted within the framework of the literature.

Theme 1: Conceptualizations of a Paperless Classroom

As reflected in Table 2, the two sub-themes that were identified for how participants conceptualized (or defined) a paperless classroom were identified as (1) digital resources as the main feature and, (2) the reduction of paper-based activities in teaching and learning. The subthemes are elaborated on below.

Sub-theme 1: Digital Resources

All of the ways that classes can be taught and run with the aid of technology are embodied by the phrase "paperless classroom" ((Lazarov, 2018; Padayachee, 2017; Furr, 2003). Students can access all of their classes, homework, and grades online by making good use of the internet. Participants in this study agree with Ncamphalala (2019) that ICT-driven classrooms incorporate cutting-edge technology like smartboards, tablets, laptops, projectors, and other information and communication tools, as well as pertinent software systems used for teaching and learning. In this regard participant identification of "paperless classrooms" concurred with the literature as they described it as: *"A smart classroom in my understanding, should equip teachers with their own laptops…, and equip the classroom with digital equipment, projectors and learners with electronic devices"* and *"…a paperless classroom is a classroom that has Smartboards… and Wi-Fi routers as well as the learners having their own digital devices for learning purposes"*.

Although "digital resources" seemed to be the key distinguishing characteristic, it was also explained how the resources were to be used pedagogically and how teachers' and students' orientations in a digital environment needed to differ. There appeared to be general agreement that using digital tools primarily in traditional ways is the way they should be done, with little emphasis being placed on how valuable these tools may be in terms of enhancing the educational experience. Hence, descriptions like the one below tend to indicate that an entrenched mind-set persists because the strategies employed still resonate with a traditional classroom. Lack of exposure to CPD training on how to teach with technology could be the other difficulty.

"*…the teacher prepares the lesson using electronic devices whether she's using a smartphone or laptop. Then, when they are presenting the lesson, the lesson can consist of PowerPoint presentation or a YouTube video"*, then *"… each learner would have a tablets device or an e-reader. They will be writing or take down notes using that e-reader or tablet.*

A new pedagogical approach to using digital tools for learning has been advocated in recent literature, including during Covid-19. It is increasingly necessary for teachers to be retrained and better prepared to deal with the demands of online learning Sikhakhane et al., (2020).

Sub-theme 2: Reduction of Paper-based Activities

Most respondents (about 79%) concurred with the idea that paperless classrooms meant a reduction of paper-based activities. In this regard, participants stated that: "*…paperless classrooms simply mean to get rid of textbooks and make life easier for learners so that they don't have to carry many textbooks to schools meaning every textbook would be uploaded onto the device"*.

…in my view, during assessment, I can say paperless classroom is administering tests without using paper at all. That is how we would administer exams and tests through the learner devices, so that learners would not have any books at all…

Meishar-Tal and Shonfeld (2019) and Chambers (2019), who report that technology has become a crucial component of the learning environment (and daily life), provide additional evidence for these views in the literature. In many cases, paper-based tasks are eliminated by being replaced with electronic ones. Furthermore, ICT, according to Kwadeli (2011), is a process that transforms manual labor activities into computerized work environments free of traditional operating procedures. Such conceptions of "paperless" classrooms mean that teachers and leaders of learning are inducted to believe that such learning environments will enhance learning because of access to digital resources. Much of the literature also begins with "digital resources" as the main feature and not the pedagogical orientations and teaching and learning processes that have to be changed when access to digital devices and the internet is possible. This is changing, however, as online learning becomes increasingly available and needed. However, when asked to compare paperless classrooms with traditional classrooms participants seemed more inclined to share deeper insights.

Theme 2: Comparing Paperless with Traditional Classrooms

Sub-theme 1: Teaching tools

All respondents indicated that teaching resources were different in a paperless classroom as compared to a traditional classroom. The digital presence and sophistication of a paperless classroom was articulated by one of the Heads of Department who stated that:

The classes have Smartboards which are also called inter-active boards, as well as Smart Cap Light Emitting Diodes (LED) boards which people also call Whiteboards, the class has the teacher's laptop as another ICT device furthermore, and classes should have learner devices such as tablet devices or smartphones…

Another aspect that was highlighted related to storage devices, namely that *"…one can basically prepare the lesson at home and save it on a USB drive"* (DPG, L38). A teacher added that:

"paperless classrooms are associated with internet connection; my idea of a paperless classroom is that it has Wi-Fi routers…". In contrast, the teaching tools found in a traditional classroom were: *"chalkboards and chalk…and learners expected to have their textbooks always with them".* This view was expanded on by another participant who said that *"the learners and the teachers make use of textbooks and hand out notes to augment the outdated nature of the textbooks"*.

In contrast to out-of-date material from textbooks, the value of digital devices seemed to be linked to the richer, more accurate, and current information they brought into the classroom. Additionally, it gave students' groups a chance to interact with peers and teachers outside of the classroom. Because of the capacity to record, playback, ask questions, and create self-directed learning pathways, the classroom may be accessed digitally at any time and from any location.

Sub-theme 2: Convenience

All respondents in this study believed that "convenience" was a factor that differentiated the two kinds of classrooms. *"…when in Smartboard classrooms one can just insert the USB* [Universal Serial Bus] *drive into the Smartboard. With easy the classwork and homework activities can be accessed with a swipe and a click…"*; *"… getting rid of textbooks… makes life easier for learners so that they don't have to carry many textbooks to schools meaning every textbook would be uploaded onto the device"*.

…in a paperless classroom … we would rely on the use of soft copy. … I just do [create] *a PowerPoint presentation. And with that presentation, I can also share the presentation electronically with the learners…so it becomes easy. We also save time. … In a paperless classroom, things are more efficient...*

In reflecting on the traditional classroom participants viewed it as "inconvenient": *"…in a traditional classroom, teachers make hard copies of notes…. you still have to write everything on the board in every classroom you teach, and by writing, a lot of time is lost during the lesson"*.

A teacher in the interview process further echoed the same sentiments and articulated a practical example:

…traditional classroom when I leave the class the next teacher erases the board and learners may not be finished copying the notes or homework which leaves them every frustrated and leave the teacher exhausted, because I need to go to the next class and rewrite the same thing on the chalk boards perhaps 6 or 7 times in one day.

In addition, another participant observed that: *"…with traditional classroom the issue of carrying textbooks to school on the part of the learner and teachers always carrying textbooks from one class to another was always a challenge… was time consuming."* It appears that the paperless classroom gives schools access to a system that can improve the efficiency of organizations and increase output outside of the classroom (Ncamphalala, 2019; Maphalala et al., 2021).

Sub-theme 3: Active learning and increased learner interaction

In terms of class interaction 42% of the respondents felt that traditional classrooms are less interactive as compared to paperless classrooms (see Table 2). From the interview a participant postulated that:

…in a paperless classroom, learners are able to watch a videos related to the lesson on the Smartboard and based on what they watched, we do an activity where they have an opportunity to provide their input, thoughts and share their experiences based on what they have watched in class which is far better than depending on them to imagine what you are trying to teach them…

Furthermore, one of the HODs opined on the inactiveness of the traditional classroom by stating:

"…I have observed in traditional classrooms, learners were very passive and the complete focus was on the teacher". Similarly, another teacher conceded that:

…in the traditional class there was not much interaction during the lesson that is why you find most teacher use the instructional method of teaching. And the kids don't interact much with the teachers because it seems like they are bored or find the lesson irrelevant to the way they want to learn.

These participants' perspectives are consistent with Makwela's (2019) assertion that "one of the cardinal properties of educational technology is that it makes learning more interesting, enjoyable, and interactive." Furthermore, students "love learning by doing, discovering, and interacting," according to Baytak, Tarman, and

Ayas (2011). It is critical to remember that ICT can be utilized to deliver fresh, real, fascinating, motivating, and successful instructional activities (Makwela, 2019). Although the teachers appear to endorse these ideas, this study was unable to interview any teachers who were actually teaching. As a result, the assertions made by teachers could not be supported. Given the rigidly South African curriculum and the overcrowded nature of classrooms, the kinds of fascinating and effective learning mentioned above are not feasible.

Sub-theme 4: Content delivery

The manner in which content was delivered in a traditional as compared to a paperless classroom was commented on by 37% of the participants. One of the participants reported that:

…how I conduct my English lessons in a smart class is that I connect my laptop to the Smartboard so that we watch a video of the play like Shakespeare unlike merely reading it from an old book which is boring for my learners.

Another respondent powerfully described content delivery in a traditional classroom by stating:

"… teaching and learning is conducted through the use of chalkboard, hand-outs and textbooks.

The teaching is too traditional; teachers mostly use narrative methods of teaching" (Respondent 11). Moreover, a participant advanced this claim and stated that content delivery in the traditional sense is *"… writing endless notes on the chalk board*".

Participants felt that learner-directed learning may be better practiced in paperless classrooms than in traditional ones in this aspect. Digital technology allowed for more teaching time and less recording time, which improved learning outcomes. This allowed educators and students to maintain repositories without having their learning time impacted. In accordance with various learning styles, learners could also study in a number of ways.

Sub-theme 5: Classroom aesthetics

The aesthetic appearance of the two kinds of classrooms was commented on by 16% of the respondents. They all felt that paperless classrooms were more attractive and inviting, especially to X and Z Generation learners. These classrooms offered a more modern or renewed look. It took on a minimalist interior with everything being found on small devices and hard drives, etc.

"*… smart classes look … very welcoming and attractive …". "…the classes have adjustable lighting systems and are also installed with blinds on the windows for lighting purposes"*. Whereas *"the traditional classrooms are a complete opposite…no doors…no light bulbs, windows are broken, and the furniture is dilapidated…. Traditional classrooms are not welcoming at all and they are honestly not conducive* [these days] *for teaching and learning"*.

This was a particularly interesting observation as classrooms as workspaces need to reflect a more modern approach to learning where learners *"would feel more at home".* The Generation X and Z learner is more comfortable and attracted to digital devices, and most engage in gaming and other social media to connect to an online world that is far wider than their physical community. This perspective offers insights into how paperless classrooms propel learners into a current world even when their homes and communities are still in a time warp.

Sub-theme 6: Classroom security

In communities where crime is rampant, measures to secure digital equipment is a necessity. This means that:

ICT classrooms have doors, burglar gates on the doors and windows as well as alarm systems to keep the devices and furniture safe,". Whereas the traditional classrooms *… are a complete opposite, some have no doors or security gates at the door or windows, no light bulbs, windows are broken, and the furniture is dilapidated due to lack of security measure*.

This has become increasingly important after investments have been stolen when security was not put into place as part of the paperless classroom design.

Sub-theme 7: Learning remotely

According to the respondents in the survey, 11% were of the view that remote learning is a feature available in paperless classroom as opposed to the conventional classroom. The excerpts from the survey corroborate this view

as one of the respondents stated that *"Teaching time is optimized and can be easily extended beyond school hours which was previously not possible. Remote monitoring is now possible. Teaching and learning can now take place from the comfort of my home"* (Respondent 5).

Since the Covid-19 pandemic, these options have taken on increased significance in order to help lower quintile schools preserve social distance while letting online teaching and learning to proceed. Knowing how to use digital tools to support at-home and independent study is advantageous for both teachers and students. It was fortunate that teachers and students could cope with lockout situations because of paperless classrooms.

For instance, we are in stage three of the Lockdown due to the Corona pandemic some learners are not coming to school… learners were still going to be engaged in school work, because with technology a class can be where you are…

Data from the interviews confirms that virtual learning in paperless classrooms is possible; one teacher provided an example to further emphasize this claim:

…a super smart class where if I'm running late I can start my lesson remotely while my learners ate in class by switching on the Smartboard and instructing my learners about the lesson and remotely. I could even send work to their devices whilst I'm still attending to a parent downstairs. A class where truly learning is online….

ICT is appropriate for situations involving distant learning, according to Takawale and Kulkarni (2016), who indicate that it enables connectivity in many locations. In contrast to traditional classrooms, where teaching and learning are restricted to the physical classroom, ICT enhanced classrooms make it simple for students to complete and submit their homework assignments virtually at any time by the deadline set by the teacher without taking up any class time.

Theme 3: Merits of the Paperless Classroom Initiative

Sub-theme 1: Improved technological pedagogical knowledge

The introduction and implementation of the paperless classroom initiative has revealed the merits of ICT in teaching and learning through the improvement of teachers' technological pedagogical knowledge as discussed below (see Table 2).

A. Media enhanced learning

ICT integration into the teaching and learning environment highlights the importance of audio and visual support for learners during the teaching and learning process. One of the interviewees made the following claim:

…there are learners who learn better when listening and watching at the same time, and playing video when teaching certain sections of work makes learning more enjoyable. Again the lovely thing about using Smartboards is that some teachers have a very small handwriting and visually impaired learners may struggle to see the font on the chalkboard but with Smartboards the font size and brightness of the screen can always bet adjusted to fit the needs of the learners. So it's actually optimizing teaching, improving teaching.

Some participants provided more practical examples:

The videos would boost what they have read in the textbooks like watching an actual chemistry experiment since our school does not a have chemistry laboratories and the apparatus to do such experiments. So what I would do is download the video and play it on the Smartboard then they'll watch the video in class just to give them an idea of the section being taught.

…as a teacher if there's a topic you're discussing with your learners who relate more to visual stimuli, …you are able to download videos related to the topic being taught and play it for them and this will assist them to understand much better.

B. Reaching learners with diverse educational needs

The data adapted from the interview process depicts that paperless classrooms afford teachers and learners with numerous benefits, since: *"with ICT the teacher is better equipped for multiple intelligences classroom, where you are able to access and ignite reading and writing skills through opening a blog for the lesson on a specific topic. Through ICT you're targeting most of the learners and their different learning styles*". Similarly, one of the participants expressed: *"the dynamics of a classroom full of learners exposes a teacher to the different way learners learn. For example, as an English teacher the use of sounds and music played on the smart devices allows my learners to remember a poem or scenes"*. Furthermore, an HOD was also of the view that ICT classrooms empower teachers' pedagogy and reported: "*It benefits the teachers as well, as they are now creating electronic lessons which*

can be easily changed and adjusted to the different cognitive needs of the learners at any time even during the lesson…"

Additionally, another participant attested: "*you can forward content through the tablets or e-readers, to individual learners based on their different levels. So, the learners that are really struggling, I can attend to separately while others are given more complex work"*.

Meishar-Tal et al., (2019) provided evidence that ICT, namely the paperless classroom initiative used in this study, has the potential to improve academic performance for children with disabilities like dysgraphia by having them type instead of write in notebooks. In order to help students who, have difficulty hearing understand the material the teacher is presenting, ICT also offers hearing aids to those students. Additionally, it offers opportunities for both audio and video records, addressing the unique learning needs of each learner. This encourages egalitarian learning since it allows students to learn at their own pace while listening to or viewing the recorded lessons. Takawale and Kulkarni (2016) point out that ICTs give teachers teaching tools that support a wide range of learning styles. For example, visual learners can watch as their teachers use visual elements, whereas audio learners can listen, and all can participate in discussions. Multimedia-rich learning can involve integrating video clips, sound or animation to a presentation or used independently to enhance and reinforce learning. The utilization of multimedia as an instructional tool can aid in the retention of material and increase engagement in the subject matter. Chambers (2019) reported that using an assortment of media increases engagement and provides distinctive opportunities to reach diverse learners.

Sub-theme 2: Effective learner assessment and rapid feedback

Participants in the semi-structured interviews are of the opinion that the assessment of learners in the paperless classroom can take place effectively and efficiently. One of the teachers posited: *"we would administer tests without using paper at all, and administer exams and tests through the learner devices, so the learners would not have any exam papers and books at all…"*. Similarly, a participant further opined that learner assessments take place in dynamic ways by stating:

I would share the test on their devices and they could use their devices to take part in the assessment or I could project the test on the Smartboard they can write the test from there. Which is a method I use sometimes when a test needs to be written,

Moreover, another participant further corroborated this claim and attested to the value and convenience of having paperless environments for purposes of assessment:

Learners would be able to do their classwork or assignment and submit electronically, even our marking would be made easier and we could design an application where they can write a test and submit online and get the results instantly. More than anything, learners, love technology and what better way to teach them than with technology…

The data concurs with the research conducted by Meishar-Tal et al., (2019) and Byrne and Furuyabu (2019) that ICT possesses the capability of offering meaningful assessment opportunities, permitting online submission and instantaneous, real-time feedback maximizing students' learning process.

Su

b-theme 3: Improve productivity and proficiency

The qualitative survey shows that 63% of the respondents are of the view that the implementation of the paperless classroom provides a great benefit to overall productivity in teaching, learning and the administrative process (Table 2). The viewpoint of one of the teachers in the interview suggests increases in productivity by stating: *"…the paperless classroom has made my life and work much easier and enjoyable. Because, lesson preparation and presentation is more efficient and I am able to cover a lot of content in the classroom…"*. One of the HODs put forward an assertion related to the accelerated productivity in the teaching and learning process by stating: *"…reduce the overload from the educators. Making our job easier…Smartboard allows us to cover more topics because time is being used more effectively"*. The notion of productivity and efficiency in school administration and learner monitoring was also elaborated on:

ICT is so broad…there is no need for me to physically keep records of textbook issued and retrieved from learners because if everyone was working on the same network, it would be easy for anyone to track if learners are have not returned school property. Everything can be centralized from a database. Even an electronic demerit system, where all teachers are aware of a learner who is misbehaving or has been suspended.

Participants' opinions supported Kganyago's (2018) and Aristovnik et al., (2020) discovery that ICT-enabled learning environments have increased both the productivity and competence of teachers and students since teachers'

workloads are drastically decreased and work is electronically saved. Byrne and Furuyabu (2019) concur that ICT, through the creation of digital materials, has the potential of assisting school administration and educators by rapidly sharing and updating information in addition to quickly making adjustments or changes when necessary.

Sub-theme 4: Digital fluency for global competitiveness

The insights of the respondents from the survey indicated that 31% are of the view that ICT classrooms expose learners to the necessary 21st century skills. The following excerpt advances the notion that the paperless classroom cultivates the skills needed for the 21st century learner to compete in the information age:

The introduction of this project in township schools in my opinion was to bridge the gap that exists between learns in previously disadvantaged areas and those in formal model C schools and private schools. In my view, I think it was trying to address the issue of learners in the township not having the basic computer skills, in this way learners were prepared for the ICT intensive environment of the universities and colleges.

Another participant also offered *"more than anything the classes are structured in a way that speaks to the needs of the 21st century learners"*. Similarly, a participant expanded on the aforementioned value of the introduction and implementation of the paperless classroom for 21st century skills by stating:

…the department of education wanted us to match the rest of the world …technology would allow us to reach worldwide standard of teaching. …everyone must be equipped, be computer literate and competed with other people around the world. …. Technology exposes South African learners to the outside world and equips them with skills to compete globally.

Furthermore, a deputy principal emphasized, "*…learners are exposed to…the uses of technology and are better acquainted and have a better understanding of technology which is necessary for them these days"*. A teacher added: *"the introduction of the paperless classroom in my view is a very good exposure for the learners, when they go out to… the work environment they will have knowledge with regards to technology"*. Educational institutions of the 21st century are obligated to ensuring that millennial learners are equipped with ICT knowledge and skills needed as the nature of jobs are becoming more knowledge oriented and require a technological skill-set (Singhavi & Basargekar, 2019).

Sub-theme 5: Accessibility of information from multiple sources

As it relates to the accessibility of information in paperless classrooms, the survey shows that 26% of the respondents are of the view that ICT is a beneficial addition to the process of teaching and learning. In light of the above data analysis, one of the participants in the interviews stated that ICT enhanced school environments are advantageous as: *"…learners are exposed to many things on the internet…"*. Similarly, from a teaching perspective a deputy principal held a similar view that the paperless classroom initiative has improved accessibility to a wide spectrum of information around the world by stating: *"…with laptops teachers are able to create e-lesson and …are able to search the internet for information they may need for their lessons"*. Furthermore, another participant further emphasized: *"It's easier to prepare lessons as a teachers and you are more exposed to references and information unlike just having two or three textbooks. With ICT you have a lot of resources that you can use as a teacher"*. Corroborating the aforementioned views, one of the respondents in the survey maintained that: *"technology ensures that the school connects with the entire world speedily. Schools can easily access information without visiting the libraries, just from the click of button"* (Respondent 15). On a similar note, Makwela (2019) asserts that owing to the immense power of ICT and the internet, learners, teachers and school leaders are readily connected to academic experts and have complete access to the global world.

Sub-theme 6: ICT enriched interaction

In the qualitative survey only 16% of the respondents expressed their opinion about the enhancement of communication and collaboration due to inclusion of technological devices within the classroom. Correspondingly,

the following extract from the survey specifies how learners and teachers communicate in paperless environments: *"learners who are using technology especially their smartphones are able to communicate with their classmates through WhatsApp groups and… also communicate with their teachers should they encounter challenges in their homework"* (Respondent 11). To further emphasize the convenience of communication in ICT classrooms, a participant from the interviews articulated: *"remember, the world is becoming a global village and therefore one can interact with people anywhere in the world"*. Moreover, a principal expressed that:

…South Africa is not an Island; therefore, it interacts with other countries. And the only key to successful interaction with other countries is to be equipped with the relevant knowledge, and that knowledge is mostly technical knowledge. We were excited that at least this type of technology in disadvantaged communities would open up some opportunities that were previously hidden or unavailable.

Similarly, one of the teachers highlighted the value of communication through a practical example:

"… I have access to learners and they have access to me at all times, which worked beautifully… during the Covid-19 lockdown". Supporting the views of the participants, Muslem et al., (2018) opine that effective lines of communication between teachers and learners are inevitable through the use of ICT in teaching and learning environments. Suffice to state that the use of technology in teaching and learning is crucial.

5. CONCLUSION AND RECOMMENDATIONS

The study fundamentally reports a research project conducted on the need for paperless classroom using the case of South Africa. The project was supported by the Member of the Executive Council (MEC) and others who promoted "access" to devices for learning, but failed to see "success" in learning when those devices were provided. The literature also touts, access, but access is not enough. For paperless classrooms to be successful there is need for: (1) teacher development (2) curriculum re-design (3) infrastructure (4) uninterrupted electricity and connectivity as well as (5) maintenance, support and upgrade budgets, so the unique contribution sits in the realm of "holistic" intervention, not "part" intervention. Thus, based on the findings of the study, the following recommendations are made;

- The conversation around the contextual reality of the DBE only providing some aspects of the interventions ("part") not the "whole" is applauded as something is better than nothing. Thus, there is need for school leaders to use their networks and agency to fill the gaps.
- The involvement of SGBs and SMTs in strategic planning and budget is critical. This would aid re-envisioning and ensuring the desired outcome.
- Younger teachers should be enrolled to support teacher digital development through workshops/mentoring/one-on-one support, team teaching, among others. This would aid their expertise with the use of technology, and eventually promote the paperless classroom.
- Harnessing expertise from the community (unemployed tech/IT graduates to support maintenance and tech support as well as repairs to broken devices) is crucial. Thus, school leaders can help promote school-community partnership in this regard.
- Lobbying for funds/support from local service providers such as Cell C, Vodacom, MTN, Rain, among others. This would help to promote the agenda of paperless classroom.
- Developing a build-up strategy to support digital needs, such as reserving funds for a generator, or software among others should be encouraged. However, this should be done with relevant and critical planning.
- Finding online self-help resources like webinars, seminars, communities of practices (CoPs), among others should be encouraged.
- Creating a CoPs with other schools in the area is paramount. This can be done by engaging schools with libraries, thereby allowing exchange of materials. Such CoP is envisaged to aid access to more relevant materials.
- Networking or finding a better resourced school as a partner, that provides advice, expertise and support as a fair exchange should be allowed and encouraged.

6. LIMITATIONS & SUGGESTION FOR FURTHER RESEARCH

Research limitations refer to the deficiencies and potential weaknesses identified by the researcher about the study that may affect the research findings and conclusions reached (Creswell, 2012). A major limitation of

this research study was a lack of time and access due to the worldwide pandemic of Covid-19. Due to the limited number of participants in this study, the results cannot be generalized to other contexts. Several districts and relevant stakeholders might contribute to the generalization of these findings (Marikyan et al., 2019).

Therefore, the study could possibly be extended to embrace a detailed investigation in which the following areas could be explored:

- The classroom experiences of teachers and learners through observation and through the development of interventions would be invaluable in improving the implementation of a paperless classroom;
- The development of pedagogical experiments through action research could provide insights into how learning can be enhanced and learner success facilitated;
- Studies that describe mechanisms for self-directed, personalized and authentic project-based learning would be valuable for teachers; and
- Studies to ascertain the perspectives of other relevant stakeholders such as learners, parents, SGB, and DBE (and not just school personnel) would assist in better implementation of the paperless classroom.

7. CONCLUSION

In conceptualizing paperless classrooms as teaching and learning environments from the perspectives of teachers and school leaders of learning provides valuable insights into the knowledge and skills needed to compete in the digital age. ICT enriched interaction serves to support the teaching and learning project in ways that enable learners to develop 21st century skills. Based on the findings, the following recommendations are made:

- Paperless classroom initiative should be promoted. This can be done by ensuring that efforts to improve and upgrade the digital resources and teacher competencies are made through periodic trainings, seminars, workshops, among others.
- More emphasis should be placed on the ways in which paperless classrooms can contribute to the development of 21st century skills in both teachers and learners;
- A stronger focus on pre- and in-service CPD both formally and through on-the-job training is needed. In this regard, CPD should be on-going;
- The employment of qualified, competent ICT assistants and onsite technological maintenance is advocated; and
- Improving policy must be done through better consultation and involvement of all stakeholders including parents and the larger community.

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