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Exploring information and communication technology integration among teachers in township public primary schools

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Despite significant capability deprivation existing among the teachers in historically disadvantaged schools in the Western Cape province of South Africa, information and communication technologies (ICTs) have had a significant positive effect on teaching and learning. In the case study reported on here we investigated the benefits of using ICTs by public primary school teachers in teaching and learning. Sen's capability approach was used to frame this study. We employed a qualitative research method in which 8 teachers were involved in lesson observations and semi-structured interviews. The findings reveal that, to some extent, through the teachers' use of ICTs (commodities) in smart classrooms, the influence of personal conversion factors (ICT skills obtained through a community of practice and university training), had created the capabilities for teachers to use ICTs for curriculum delivery, although to a limited extent. Through this process, teachers benefited with specific vital achievements. From the study we recommend that holistic and annual professional development training programmes should be made mandatory for both novice and seasoned teachers.

Keywords: capabilities; conversion factors; information and communication technology; learning; primary schools; teaching

Introduction

In South Africa, a developing nation, the Western Cape province continues to be one of the leading provinces in successfully implementing ICT integration in education (Graham, Stols & Kapp, 2020). The Western Cape Government's (WCG) electronic learning (e-Learning) Game Changer project was introduced and intended to function for only 5 years (2015–2019). The WCG envisaged that by 2019 all teachers in the province would be both skilled and motivated to integrate technology effectively into their teaching and curriculum implementation (WCG, 2019). The stated aim and vision of the WCG's e-Learning Game Changer project was to encourage teachers and learners in public schools to use technology efficaciously to improve teaching and learning in subjects such as mathematics and the languages (Republic of South Africa, 2015). Approximately 6,421 smart boards were placed and installed in some public primary and high schools throughout the province through the project, with more than 2,000 teachers having received ICT training between 2015 and 2019 (WCG, 2019).

Prior to and since the introduction of the WCG's e-Learning Game Changer project, a range of complex factors had been identified that appeared to limit teachers' and learners' capabilities for using ICTs confidently and effectively in classrooms (Madoda, 2018; Tiba, 2018). These factors are what Sen (1992) refers to as "conversion factors." Conversion factors are factors that either deny people from or allow them to convert capabilities into functionings (Robeyns, 2018; Zheng & Walsham, 2008). According to Sen (1999), functionings are achievements or fulfilment of desires. For instance, Tiba (2018:127) found that those teachers in Western Cape schools who integrated ICTs in their classrooms did so to fulfil specific desires, such as enhancing learning through the use of technology, facilitating collaborative learning, improving learner self-confidence, and developing in learners a greater sense of inquiry through their use of the internet.

Functionings disclose several aspects that a person may value doing or being (Sen, 1999). Depriving teachers of individual capabilities related to ICT use may lead to a lack of specific potential or real achievements (Sen, 1999). While ICTs may be available for teachers at their schools to deliver the curriculum, if they cannot use these ICTs due to certain factors, such as a lack of ICT skills, the availability of ICTs is not likely to result in the functioning (benefit). Therefore, the extent to which teachers can achieve functionings from smart boards is influenced by these factors (Chigona & Chigona, 2010). However, the enhancement of factors (e.g., providing teachers with adequate ICT training to improve their skills) would create the capability for teachers to integrate ICTs for teaching and learning. Having this capability may thus lead to the fulfilment of a teacher's functionings while also contributing to the happiness (well-being) of both the teacher and the learner (Chigona & Chigona, 2010).

In light of those mentioned above, the purpose of this study was to answer the following research question: What functionings were realised by primary school teachers in township public primary school due to ICT integration?

Literature Review

The importance of information and communication technology integration in teaching and learning

A comparison between current teaching and learning experiences and those of 20 years ago shows a difference in ICT use. Two decades ago, ICTs were rarely used in South African schools. The advancement and ease of accessibility of ICTs have since measurably influenced the teaching and learning culture in classrooms (Waghid, Z & Waghid, 2018). Makwela (2019) endorses this view, arguing that emerging ICTs, such as computers and the internet, have become essential tools in education since they possess the power to influence and change the nature of teaching and learning significantly. Researchers have found that integrating ICTs in those South African schools that have managed to achieve this, has resulted in promoting effective teaching and learning in the classroom (Buzuzi, 2020; Madoda, 2018; Makwela, 2019).

The use of ICTs in teaching and learning has been shown to allow learners to understand and thoroughly question how things work (Waghid, Y, Waghid & Waghid, 2016). This suggests that the use of ICTs in teaching and learning challenges learners not merely to memorise, but to think independently and critically, thus having the potential to change the persisting predominantly teacher-centred, rote learning pedagogical paradigm in many schools in South Africa.

Mugani (2020) conducted a study investigating the pedagogical impact of smart classrooms on Grade 11 teachers in the Gauteng province of South Africa. The findings suggest that teachers may use ICTs in smart classrooms for several benefits, which include the following:

- To create an environment where learners are keen to learn (attract learners' attention);
- To help learners to find it more conducive to learning to use visual and audio aids;
- To improve and increase learner participation in the classroom lesson activities;
- To save teaching and learning time: e-textbooks and other tools may be loaded on smart boards, which makes the work easy and less time is spent on planning the lesson; and
- To cover a lot of curriculum content in a short period.

Despite the potential benefits and advantages of ICTs in teaching and learning, some teachers in schools in the Western Cape are not keen to integrate ICTs in their curriculum delivery, mainly because of insufficient ICT skills and resources. In this context, Suryani (2010) and other researchers argue that some teachers do not use ICTs in their teaching since they believe that it does not matter how much they excel during their training. Often the reality is that they find it impossible in practical terms to implement their ICT knowledge and skills when they return to their respective schools, and in most cases, their inability to implementing these skills may be due to the absence, or severe lack of ICT resources at their schools (Suryani, 2010). Providing teachers with continuous training in ICT use and matching this with the availability of ICT resources can help improve the use of ICTs and can significantly improve those ICT capabilities deemed necessary for effective teaching and learning.

Madoda (2018) discovered that most of those ICT literate teachers in some schools in the Western Cape had acquired their ICT skills incidentally during their years at university. The findings by Buzuzi (2020) seem to agree with those of Madoda (2018), specifying that newly qualified teachers who have spent 4 years' teacher training at a university are more confident to integrate ICTs in their teaching, as they might have been specifically trained in the use of ICTs in teaching. In addition to the ICT skills that teachers acquire through university training, Mahlo and Waghid (2022) found that in some public primary schools in the Western Cape, only a conversion factor – such as the teachers' acquisition of ICT skills through communities of practice – provided them with the capabilities to use ICT to effectively perform essential ICT skills and deliver curriculum content. Thus, from these studies (Buzuzi, 2020; Madoda, 2018; Mahlo & Waghid, 2022), it may be concluded that the quality and type of teacher development related to ICTs that pre-/in-service teachers are exposed to during their studies and/or during their in-service practice is more likely to have a positive impact on their teaching.

Information and communication technology tools commonly used in a smart classroom

Electronic books

According to Embong, Noor, Hashim, Ali and Shaari (2012), an electronic book or e-book is a book that can be shown and read on an electronic device instead of being printed on paper. E-books are used for various teaching and learning purposes, such as to improve learners' reading skills (Wang, Lu & Lee, 2011). The use of e-books as literacy practice may provide learners with the opportunity to read along in order to improve their vocabulary (Wang et al., 2011). E-books are considered a tool that makes lessons more fun, and there is no doubt that electronic devices used to store these e-books are more convenient to carry than traditional printed textbooks.

Google maps

Google Maps enables users to explore geographic locations anywhere globally on satellite images and aerial photographs (Lamb & Johnson, 2010). The use of Google Maps can increase learners' interest and knowledge in subjects such as natural science, geography, and history, helping them understand certain concepts and topics more clearly (Landicho, 2020). Since learners can see close-up views of geographical areas using Google Maps, teachers and

learners are provided with the opportunity to visualise countries, continents, and engage directly with other geography or history topics in their natural or global context.

Presentation software

Microsoft's PowerPoint application software enables an individual to create slides that integrate words, images, sounds, and videos (Reich & Daccord, 2015:5). Sankey, Birch and Gardiner (2010) believe that learners learn better when a combination of words and pictures are used in PowerPoint presentations than they do from words alone. Using PowerPoint slides, teachers can engage learners by asking them to analyse or interpret the images shown in the slides (Reich & Daccord, 2015). This method challenges learners to think as they need to concentrate on the features of the picture. Having critical points prepared on the PowerPoint slides displayed on the screen or smart board, instead of writing texts on the board can save teaching time (Lewis, 2004:9). Tiba (2018) also found this to be the case in her study on newly qualified teachers who reported that, because teaching and learning time was saved when they integrated ICTs in their teaching, they had more time to spend focusing on their learners. Moreover, ICT not only saves teaching time, but it also saves paper.

Online video-streaming

YouTube is an online video-streaming platform that contains videos in all areas of knowledge that can be recovered quickly (Kabooha & Elyas, 2015:3526). Reich and Daccord (2015) argue for using YouTube videos in the classroom as essential, enabling teachers to draw on other voices and images to enrich their teaching and their learners' learning process by engaging learners in different learning styles. YouTube videos incorporated in an introduction of a lesson can make challenging ideas and concepts easier to understand for learners (Kabooha & Elyas, 2015). Indrasari (2015) also values the use of YouTube as a teaching tool, indicating that learners tend to pay more attention when videos are played in the classroom. YouTube videos are suitable for use within the limited time given to teaching and learning in a lesson since, particularly at the primary school level, they are usually of reasonable length for use in a limited lesson period (Kabooha & Elyas, 2015). According to Indrasari (2015), videos also assist in improving learners' writing skills. For example, learners can watch a short story with both visual and quality sound and, with prompts from the teacher, write a summary of the story individually in their own words. Kabooha and Elyas (2015) point out that YouTube videos may be valuable to learners learning a second language as these learners can watch and listen with interest while learning new vocabulary, language structures, and skills. Moreover, these authors regard the use of YouTube videos by teachers as minimising the level of anxiety among leaners should some of them be particularly unfamiliar with the language being taught (Kabooha & Elyas, 2015).

Video conferencing

Video conferencing is a communication tool that allows users to share visual and audio features in real time (Al-Samarraie, 2019). In other words, video conferencing allows people in different locations to connect using the internet, while at the same time enabling them to see and hear each other. According to Correia, Liu and Xu (2020), four video conferencing tools are commonly used: Zoom, Skype, Microsoft Teams, and WhatsApp. Al-Samarraie (2019) argues that video conferencing used as a teaching and learning tool in education maintains effective communication between teachers and learners, especially when face-to-face meetings are not possible due to barriers such as the coronavirus disease (COVID-19) pandemic. Based on the literature cited in this section, it can be argued that, through video conferencing, teachers may connect with the classroom next door or virtually bring experts into the classroom to enhance teaching and learning.

Theoretical Framework

Contrasting many philosophical approaches that emphasise peoples' happiness or on socio-economic issues, the capability approach is concerned with individuals' capabilities, that is, what people can do or could be (Sen, 1985, 1995, 1999). The approach focuses mainly on people's capability to have the freedom to do things (Sen, 1999). Freedom plays a vital role in the enrichment of individual abilities in order for people to be more independent and to help themselves (Sen, 1999). This approach was intended to be used for different purposes (Zheng & Walsham, 2008). Thus, in social sciences dealing with ICTs, it has also been used as a guiding framework (Madon, 2004). Basic concepts of the capability approach are used in this study as a means of guiding this study.

Functionings and capabilities are the most basic concepts of the capability approach (Sen, 1995). According to Sen (1995:110), functionings are physical and emotional states like being well-nurtured, healthy, feeling protected, literate, happy, being involved in societal activities, respected, and, most importantly, having the freedom to participate in social and political life. Hence, these states of being, and doings, are referred to as "achieved functionings" and they are what makes life valuable for an individual, and their feeling and being fulfilled (Kuhumba, 2017:131). On the other hand, capabilities are represented by different functionings (Sen, 1995, 1999; Zheng & Walsham, 2008). Capabilities are the opportunities available to people

to live the kinds of lives they desire (Alampay 2006:14), or in other words, "the extent of one's positive freedom" (Alampay, 2006:3).

Well-being and agency are two further concepts of the capability approach (Sen, 1995). According to Sen (1995), well-being is found where people are free and have a good life. On the other hand, Sen (1985) explains agency as situations where people can realise and value important things. Thus, a person is regarded as an agent whose happiness is their primary concern (Sen, 1995). We were interested in understanding the relationship between commodities, in this case, ICTs (smart boards) provided by the WCG's e-Learning Game Changer project, and conversion factors that create capabilities and functionings for teachers.

A person's capability to use commodities is influenced by a range of conversional factors (Sen, 1995). Zheng and Walsham (2008:227) point out some of these factors:

- personal characteristics (physical state, literacy; and gender);
- social characteristics (policies or social norms); and
- environmental characteristics (weather, infrastructure, resources; and public goods).

Individual differences and choices play a significant role in whether people use available commodities and how they use them (Zheng & Walsham, 2008). By implication, even if ICT resources are made available, people can use them or not. Personal choices influenced by decision-making mechanisms, such as personal preferences and social pressure, determine functionings' actual achievements.

Methodology

Two (n = 2) public primary schools from the Metro East Education District (MEED), in the Western Cape province were purposefully selected to participate in the study. According to Creswell and Guetterman (2019), purposive sampling is when researchers select participants deliberately to learn more about a central phenomenon. In this study, the public primary schools referred to as School A and School B are situated in the City of Cape Town municipal area in the Western Cape. These schools are historically disadvantaged and have since the introduction of the WCG's e-Learning Game Changer project started using ICTs for teaching and learning. Both schools are categorised as quintile 3 schools, as they are no-fee schools that receive a subsidy from the government. The South African government categorises quintile 1 to 3 schools as economically disadvantaged based on their being in the most impoverished geographical areas. Quintile 4 and 5 schools are in the economically advantaged category, receive little or no subsidy from the government and are located in the more affluent urban and geographical areas (Ogbonnaya & Awuah, 2019). Both schools are located in a previously disadvantaged township of Khayelitsha and have both received smart classrooms (smart boards) from the WCG e-Learning Game Changer project.

Permission to conduct research was secured from the Faculty of Education's Ethics Committee at the Cape Peninsula University of Technology (CPUT) and the Western Cape Education Department (WCED). The teacher participants were also provided with consent forms that they signed to give their permission to participate in this study. These teachers were selected voluntarily. The sampling consisted of eight (n = 8) teachers equally selected from both schools and who taught in the Foundation and Intermediate Phases and are referred to as Teachers A, B, C, D, E, F, G, and H to safeguard their anonymity (cf. Table 1 below).

Table 1 Academic background of teachers

School	Teachers	Age	Qualifications	Grade and subjects taught	Years of teaching experience	ICT training
A	A	40	Bachelor of Education (BEd): Foundation Phase Teaching	Grade 3: IsiXhosa, English First Additional Language (FAL), mathematics, and life skills	3	Yes
	B	31	BEd: Mathematics and natural science	Grade 6: Mathematics and English (FAL)	5	Yes
	C	32	Postgraduate Certificate in Education (PGCE): Further Education and Training (FET) Mathematics and Physics	Grade 6: Mathematics and natural science	6	Yes
	D	56	Primary Teacher's Diploma, Higher Diploma in Education, and Advanced Certificate in Education	Grade 2: IsiXhosa, English (FAL), mathematics, and life skills	26	Yes
B	E	51	Junior Primary Teachers' Diploma, and Advanced Certificate in Education	Grade 2: IsiXhosa, English (FAL), mathematics, and life skills	15	Yes
	F	38	BEd: FET Phase (Accounting and economics)	Grade 6: English (FAL) and life skills	9	No
	G	26	BEd: Senior Phase and FET teaching (mathematics and mathematical literacy)	Grade 5: English (FAL) and mathematics	4	Yes
	H	56	Junior Primary Teachers' Diploma, and Advanced Certificate in Education	Grade 2: IsiXhosa, English (FAL), Mathematics, and life skills	19	Yes

All eight (n = 8) teachers taught subjects that included IsiXhosa Home Language, English First Additional Language, and mathematics in Grades 2 to 6. These subject had received much attention compared to other subjects in WCG's e-Learning Game Changer project.

Data were collected and analysed using a qualitative research approach and an interpretivist paradigm. We considered the qualitative research approach that included case study research design of the WCG's e-Learning Game Changer project to be appropriate for this study since the primary purpose of the study was to explore, investigate, and learn more about a social phenomenon (Creswell & Guetterman, 2019). Creswell and Guetterman (2019) endorse this particular qualitative research model, advocating for researchers to collect data through observation and research participants' interviews. To ensure the accuracy of our field notes, we designed and used an observation checklist to record notes during lesson observations of eight (n = 8) teacher participants. The use of an observation checklist ensured that the field notes we took were usefully and adequately organised. We observed one lesson per teacher. In-depth semi-structured interviews with all eight (n = 8) teachers were conducted primarily to investigate their experiences and perceptions concerning their

use of ICTs in their smart classrooms. Semi-structured interviews were mainly chosen since they allow the interviewer to ask participants to clarify their answers, and include participants asking the interviewer to clarify the questions (Galletta, 2013:24). With the participating teachers' permission, we used an audio recorder to gain an accurate record of each interview.

Audio recordings of interviews and observational notes were then transcribed. Data transcription is a process that involves converting audio recordings or field notes into written/typed data (Creswell & Guetterman, 2019). This process involved transcribing in full the actual words uttered by the participants during the interviews. After the transcription process, the transcripts were extensively analysed using computer-assisted qualitative data analysis software (CAQDAS) namely, ATLAS.ti. We also relied on the theoretical proposition of Sen's capability approach to analyse data (Sen, 1985, 1995, 1999). The capability approach enabled us to determine the factors that empowered the teachers in the study to achieve their capabilities, after which the functionings of teachers from using ICTs were identified.

Findings

The data reveal that, despite capability deprivation existing in these schools, some of the participant teachers were willing and able to convert the available ICTs into particular functionings. This was linked to these teachers being able to use and enhance their ICT literacy to deliver the curriculum as a result of them being members of a community of practice and having had ICT training at university. This finding is consistent with that of Mahlo and Waghid (2022). The achieved functionings are highlighted in Table 2 below.

Table 2 Achieved functionings

		Functionings (achievements)			
School	Teachers	Teachers' enhanced point of efficiency	Teachers' heightened level of creativity	Teachers' augmented degree of pedagogical flexibility	Teachers' sense of agency
A	A	X			
	B	X	X	X	X
	C		X		X
	D			X	X
B	E		X		X
	F	X			
	G	X	X	X	X
	H	X			X

Table 2 only shows the data related to functionings obtained through semi-structured interviews with the participant teachers. This was based on the assumption that it would not be possible to observe the teachers' functionings (achievements) in their classroom teaching. Therefore, teachers used the symbol "X" to imply or indicated whether their use of ICTs in smart classrooms helped them achieve certain functionings, albeit to a limited extent.

Five (n = 5) of the eight (n = 8) participant teachers acknowledged that the use of ICTs had enhanced their efficiency (cf. Table 2). This may have had positive implications in the teaching and learning in the Grade 3 classes taught by Teachers A and H. In response to the interview question: "In your own opinion, how does the use of ICTs enhance teaching and learning?", Teachers A and B at School A, and Teachers E, G, and H at School B acknowledged and highlighted specific improvements that they were aware of in their teaching since embarking on the use of ICTs, including saving time and sharing of lesson material:

> Teacher A: *... I would go to bed knowing that I'm prepared for the next day with my PowerPoints notes ready for the next day. It makes my job easier and it saves my time.*
>
> Teacher B: *... it* [PowerPoint slides] *makes your work easy so that you don't take much time in writing notes on the board.*
>
> Teacher E: *... we prepare notes for the entire grade using PowerPoints slides so that we teach the same thing in my grade, and that helps us to save time.*
>
> Teacher G: *... I have to constantly write on the board, there's no space and its time consuming, but if I have like a PowerPoint slide presentation, I don't have to keep rewriting.*
>
> Teacher H: *... children will look at the prepared PowerPoint slides on the smart board, and that helps to spend my teaching time wisely*.

Smart boards were preferred by those teachers who were willing to use ICTs as the most valuable ICTs to ease their workload and to simplify their daily teaching tasks. These teachers also reported that they sometimes added multimedia inputs such as pictures and sounds in their PowerPoint slides to make lessons more interesting. This finding is in line with Tiba (2018) who points to the educational value of ICTs in blended learning, describing how these tools made learning easy and enjoyable for the teachers in her studies, while promoting the efficient use of teaching time. Although these teachers mentioned that they mainly used PowerPoint slides for subject content delivery in their lessons, only three teachers (A, B and G) were observed using PowerPoint slides in their lessons. Teacher A at School A was observed using PowerPoint slides in what could be deemed an effective way for her Grade 3 English lesson on healthy foods. During this lesson she showed images of types of foods on PowerPoint slides. In our observations, learners seemed to engage fully in the lesson, and at least half of the class raised their hands to answer questions.

Based on the teachers' comments and our observations of the lessons, the availability of

laptops with Microsoft PowerPoint applications provided most teachers with choices and the freedom to choose how to teach, while at the same time providing them with opportunities to be more creative (cf. Table 2) in their teaching. Teachers B and C at School A and Teachers G and E at School B reported valuing this opportunity to use the available ICTs in ways they wanted to, which they implied as enabling them to enjoy their teaching more. Moreover, according to some of the teachers, learners could learn effectively through the visuals supported by text in the lessons. These four teachers showed their enthusiasm for this more visual and enriched presentation of the subject content:

> Teacher B: *When I use PowerPoint slides and also show pictures in them, learners become more interested in the lesson. Also it makes it better for me because I can also point to the pictures and explain.*
>
> Teacher C: *… learners nowadays are more learning visually because they watch these things. For example, when I use PowerPoint, I would write on each slide a subheading then put pictures. So, they learn faster than when you just tell them by word of mouth.*
>
> Teacher G*: As you saw, when I was using PowerPoint, I included both pictures and the explanations of the pictures because in my experience, this helps learners to understand better*.
>
> Teacher E: *… and these PowerPoints slides we include pictures and voices of people. Children love it when they can see pictures and hear sounds.*

The findings clearly show that these teachers felt that using ICTs helped their learners understand content due to the graphics and, in some instances, to the videos. The four teachers' comments strengthen the arguments by Sankey et al. (2010) on the benefits of multimodal learning: learners learn better when words and pictures are combined, and ideas and concepts are demonstrated on PowerPoint presentations, than when only words are used. From the data presented above, it can be understood that the four participant teachers valued their freedom, even though limited, to use their laptops in ways they choose to do, and whenever they were given an opportunity, to enrich their teaching.

It was evident from the interviews and lesson observations of three participant teachers, Teachers B and D at School A and Teacher G at School B, that these teachers valued the opportunity of having access to the internet. These teachers reported that the availability of ICTs in their schools provided them with the opportunity to quickly change their teaching styles by using, for example, online videos, and through this, to enhance flexibility (cf. Table 2) in their teaching and increase the variety of their teaching styles. An additional benefit was that learners appeared to have enjoyed lessons which incorporated videos. These teachers commented as follows:

> Teacher B: *It helps learners because they experience different teaching styles because you come as a teacher, but you can also use lessons from other teachers … for example here at the school we have a Wi-Fi that is available every day to be used by teachers so you can use certain sites for teaching, like YouTube.*
>
> Teacher D: *My learners can watch other teachers online, and I can also learn from other teachers …. As a teacher, I can also learn new teaching styles from the videos. Videos also improve my flexibility in class.*

Although we did not observe Teacher G at School B using videos in her lesson, during her interview, she explained that when she used videos in her lessons, she sometimes paused the video and asked questions based on the content of the video, then continued the video to let learners check if their answers were correct. In this instance, she commented on the flexibility this allowed her in her teaching:

> Teacher G: *Sometimes, when I'm using YouTube videos, I can be very flexible. Like in a maths lesson, I would let a video play and stop letting my learners guess the answer.*

When we observed Teacher B at School A, the teacher played a video in his Grade 6 mathematics class on multiplications. The teacher paused the video from time to time to interact with learners, asking them questions about the content of the video. In the observation of a Grade 2 lesson taught by Teacher D at School A, after her learners had watched and listened to a 2-minute video of a person reading a story in a YouTube video, the teacher encouraged learners to reflect on, and write about, what they had heard. This teaching strategy helped develop learners' listening, comprehension, thinking, and writing skills. This teaching strategy using these particular ICTs is similar to an example given by Indrasari (2015) in a study conducted in Indonesia where learners were provided with the opportunity to watch and listen to a short story with clear sound, and then wrote a summary of what they had understood from the story.

The findings show that the use of ICTs in smart classrooms to deliver the curriculum played a significant role in allowing the participant teachers – in varying degrees – to improve their sense of agency (cf. Table 2). In the observation of three participant teachers at School A, Teachers B, C, and D, and two participant teachers at School B, Teachers E and H, we noted that, in all classes where teachers were using videos in their lessons, ICTs had the effect of attracting and keeping learners' attention. This observation was similar to conclusions drawn from the findings by Indrasari (2015) that learners tended to pay particular attention and to sustain this attention when videos were shown in class. Teachers confirmed this conclusion:

> Teacher B: *Most of the time I would use these resources when I'm starting or introducing a new topic. And more especially if I think the topic is difficult for them to understand quickly.*

> Teacher D: *Sometimes online videos can be useful for gaining the attention of your learners, and also it helps not to lose that attention … if you use technology like videos and pictures, they become interested in the lesson.*
> Teacher G: *So most of the time the teacher has to explain, but if we have ICT, we give the learners chance to actually look at someone else besides me who's always talking, which then attracts their attention.*

These comments seem to align with the findings of Kabooha and Elyas (2015). These researchers argue that the use of YouTube videos is mostly suitable when introducing new topics since these videos can make difficult concepts more accessible and draw the attention of academically challenged learners. The findings from our study show that participant teachers indicated that, on the whole, teachers valued the opportunity presented by the accessibility (although limited) of ICTs and for them to use these ICTs. They found that ICTs attracted and focused learners' attention and helped them understand better and quickly since they could see objects and concepts related to their natural context.

Table 3 Summary of conversion factors linked to teachers' capabilities and the identified achieved functionings

Commodity	Agents	Conversion factors	Capabilities (freedoms): Well-being	Capabilities (freedoms): Agency	Functionings (achievements)
Smart classroom ICTs	Teachers	Personal conversion factors • ICT literacy in terms of ICT skills obtained through a community of practice and university training	• To use ICTs to deliver curriculum content with necessary ICT skills	• To be able to perform basic ICT skills effectively in the smart classroom	• Teachers' enhanced efficiency • Teachers' heightened level of creativity • Teachers augmented degree of pedagogical flexibility • Teachers' improved agency

Discussion

In response to the research question, the conversion factors allowed teachers to convert capabilities into functionings in their smart classrooms. Most of the participant teachers indicated that their use of ICTs, although limited, helped them save teaching time and enhanced their efficiency (cf. Table 3). These teachers seemed to appreciate that they no longer had to write notes on the board using the chalkboard method. Instead, they could prepare PowerPoint slides in advance and use them later – and with more than one class in a grade – in their smart classrooms. The comments made by teachers at both of the selected schools indicated how ICTs, particularly PowerPoint applications, had enhanced their efficiency as the ICTs provided them with the freedom to achieve a higher level of productivity with the minimum time taken from valuable teaching and learning time. This finding is consistent with that of Lewis (2004). Our conclusion from this finding is that, through ICTs, teachers can become more productive in their work and need to use relatively little time and effort generating teaching resources. In other words, for these participant teachers, this meant that they could spend more time on teaching and ensuring that curriculum content was covered within a shorter period in comparison to what would have been accomplished using traditional teaching methods.

The data analysis revealed that some teachers regarded their use of ICTs, although limited, as a heightening of their levels of creativity (cf. Table 3). These teachers felt that integrating multimedia effects in their lessons, such as sound, video, pictures, and words in PowerPoint slides, had heightened their creativity. Teachers' creativity in using ICTs helps create an inclusive learning environment where learners learn in different ways. Thus, incorporating different multimedia effects in a lesson is an opportunity to accommodate and encourage all learners.

The use of ICTs afforded some teachers with increased pedagogical flexibility (cf. Table 3). Although these teachers had limited access to ICTs, they seemed to appreciate that they could use ICTs in any way they wanted in their smart classrooms whenever they had the chance. Teachers can access a wide variety of subject content that supports and aligns with the curriculum. This means that teachers are no longer forced to stand in front of the class and talk all the time. They can move away from the talk-and-chalk teacher-centred approach and use other

teaching styles, such as using ICTs and online resources to make their lessons more interesting and varied. This is done to prevent that sometimes, learners may become uninterested or bored when repeatedly hearing the same voice (Reich & Daccord (2015).

Moreover, the use of smart classroom ICTs afforded some, although not all, of the teachers a sense of agency (cf. Table 3). These teachers believed that ICTs boosted teachers' confidence. In other words, as much as the participant teachers had limited access to ICTs, they implied that the use of ICTs in their and other teachers' teaching had the potential to make teachers feel more in control of their pedagogical practices affording some of the teachers with a sense of agency. Also, ICTs allowed these teachers to secure and sustain their learners' attention in the classroom, a phenomenon Indrasari (2015), Kabooha and Elyas (2015) and Mugani (2020) alluded to. We thus conclude that ICTs have high potential to change the classroom from being teacher-centred to being learner-centred.

Although all of the teachers in this study reported having been exposed to a wide variety of ICT software application tools in the WCED professional development workshops, many continued to limit their use of ICTs to necessary tools such as Microsoft PowerPoint, and YouTube videos as a means of conveying information. This indicates that these teachers were more comfortable using essential ICT software application tools than using the range available to them to ensure that they were relaying information to their learners efficiently and effectively. It may also mean that these teachers were more comfortable conveying information when in a position of power to feel that they were in control of the few essential ICT software application tools.

Conclusion

In this study we found that, despite teachers lacking certain capabilities due to limited access and use of ICTs, they showed that they had managed to achieve four important functionings: efficiency, creativity, pedagogical flexibility, and a sense of agency in the course of their using ICTs. This was due to the availability of personal conversion factors, such as ICT skills obtained – albeit to date to a limited extent – through a community of practice and previous training at university. Through this study we provide practical implications for WCED provincial policies on teacher ICT training to transition from focusing mainly on the number of resource materials for improving ICT skills towards the pedagogical significance of using such resources. More specifically, to acquire the required skills, these teachers should, when using the available resources freely without any obstacles, achieve what they consider valuable (functionings). At the theoretical level, the findings of this study contribute to the modification of Sen's capability approach, which may serve as a guide in studying and understanding the relationship between capabilities and functionings in the area of educational technology. It should be noted that a limitation of the study is that the results cannot be generalised due to the small sample size. Therefore, we suggest a study on a larger scale to be conducted in distinct educational contexts to investigate what functionings may be realised by school teachers as a result of the integration of ICTs in public primary and high schools.

Authors' Contributions

LM wrote the manuscript and provided data for all tables. Both authors analysed data using computer-assisted qualitative data analysis software (CAQDAS), ATLAS.ti. ZW reviewed and made the necessary changes to the concept and final manuscripts. ZW was the research supervisor of LM's Master of Education (MEd) study.

Notes

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ii.
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