




SOUTH AFRICAN TEACHERS' PERSPECTIVES ON USING THE COMPUTER AS A TOOL FOR TEACHING AND LEARNING

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ABSTRACT

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The aim of this paper was to explore teachers' perspectives on the importance of the computer as a tool for enhancement of effective teaching and learning. Current research indicates that the developed world is at vanguard in revealing most of this information much more than developing nations like South Africa. Taking cognizance of teachers' perspectives in South Africa helps in improving the educational dispensation systems because future economic realities of any country depend on the quality of its education. Using an interpretivist paradigm, semi-structured interviews were triangulated with participant observations to elicit detailed data from a case study involving three secondary schools that were purposively sampled by virtue of having and using computers. A sample of six participant teachers was interviewed, and one lesson of each was observed using computer tools. Findings reveal that computer usage was irregular, rather superficial and insignificant. This small scale investigation recommends that Technological Pedagogical Educational Psychology and Content Domain (TPEPCD) model should be adopted in all teacher training institutions; so as to enhance the professional development of teachers who can teach diligently in accordance with the Fourth Industrial Revolution (4IR) requirements.

Contribution/Originality: The primary contribution of this study is to encourage policy makers, educational planners and the South African Department of Basic Education, in particular to adopt proactive and practical measures to enhance teachers' professional repertoire in the wake of digital technologies and trends of the 4IR. Furthermore, these findings hint at the contingent global educational trends and suggest Education and e-Learning policymakers how to make decisions from an informed perspective.

1. INTRODUCTION

Use of computer tools has made the world 'smaller' as teachers can reach out to several learners all over the world through virtual classrooms by a mere click of the computer button. Jantjies and Joy (2016) stated that the use of computer technology has become an important aspect of the teaching and learning process across the world. Effective computer usage allows learners to stay focused on given tasks as it promotes learning through multiple ways (Edutopia, 2014). Similarly, Eristi, Kurt, and Dindar (2012) emphasize that "learning, supported with activities which address more than one sensory organ" enhances learner-motivation and engagement thus leading to

permanent and meaningful learning. Thus, in this respect effective use of the computer tools enhances quality teaching and learning.

The purpose of this study was to explore teachers' perspectives on the use of the computer tools to teach the secondary school curricula. It collected the views of teachers with regard to computer literacy levels, availability of computers resources in their schools and multi-stakeholder support taking cognizance of the fourth industrial revolution (4IR) challenges. The aim was also to ascertain challenges encountered that hindered the use of computer tools for teaching and learning the curricula.

2. BACKGROUND

Expressing importance of computer technology for teaching and learning, Kennah (2016) states that “teachers and students can easily get connected making it possible for teaching and learning to take different innovative platforms.” Hence nowadays it becomes clearer that pervasiveness of digital technology determines the quality of education around the world. Information and Communication Technology (ICT) is the use of computer-based communication (Ghavifekr & Rosdy, 2015) incorporated into daily teaching and learning process. In line with Kennah's argument, and the challenges of the Fourth Industrial Revolution, this study unequivocally propounds that use of computer tools, nowadays, dictates that it is the most productive route to be taken both educationally and ultimately economically. Above all, in concurrence with Kennah (2016); Eristi et al. (2012) vehemently stressed that “a better and more powerful future for countries depends on the quality of the training” provided to the young generation which precisely depended on the relevant technological environments established for these individuals.

It was, therefore, essential to identify gaps in the teaching and learning process so as to be in touch with changes taking place in accordance with technological changes. The apt reason for identification of educational challenging gaps, and taking proactive action and delving in profound gap-closing research, was to suggest necessary changes, and improve the current pedagogical curricula. Another objective was to identify adaptive advocacy (mechanisms) and tactics that will allow the future generation (Gen-Z) to live to its fullest potential (World Economic Forum White Paper, 2017). In congruence, Lesufi (2017), a member of the Executive Council of Education, stated: “The pace of developments in the digital economy necessitates a shift from traditional modes of teaching and learning to a curriculum that captures the spirit of the times and equips our children with the skills and competencies required not only for individual success, but also for the success of our economy and our society at large.”

The aforementioned enlightenment irrevocably indicates that evaluation of the effectiveness and efficiency of our educational platforms should be constantly re-evaluated since skills and competencies required in the world of work change exponentially. Besides, ubiquitous digital technologies; presumably imply that relevant and desired competencies of today could be regarded obsolete with the passage of time (Siemens, 2005) Hence the necessity to always realign our teaching-learning processes with changes in technology is emphasized .

A proactive approach is needed in the selection and training of teachers who are skilled enough to teach in alignment with the requirements ‘enforced’ by the advent of the 4IR. In line with this, Professor Jan Heystek, the research director, in North West University's Faculty of Education, quoted by Joseph (2018) “agrees that people selected to become teachers are not necessarily the best quality students we can get” the situation of which is worsened by insufficiency in terms of university facilities, infrastructure and staff allocations to do the job; hence universities fail to cope with the large numbers of students studying to teach.

Current research indicates that digital technology plays a crucial role in enhancing authentic instruction and learner academic achievements (Milla, Kurt, & Mataruna-Dos-Santos, 2019; Yunus, Zakaria, & Suliman, 2019). This justifies the need for meaningful knowledge on e-Education policy intents. Accordingly, the goal of South African e-Education policy (Department of Education, 2004) asserted that all learners in the General Education and Training (GET) and Further Education and Training (FET) bands should have had access and be able to use computer tools

to enhance performance by the year 2013. In this regard [Eristi et al., \(2012\)](#) too asserted that teachers' own use of computers benefitted teaching and learning across the curricula. This also concurred with the White Paper 7's goal and corresponded with the fact that effective use of computer teaching catalyzed authentic learner performance.

With regard to the challenges of the 4IR, [Eristi et al. \(2012\)](#) found out that well equipped teachers, in terms of training, computer resources and school infrastructure, can efficiently use computer tools in teaching and enhancing learners' achievements, upon which the future of more powerful countries hinged. Unfortunately, the Department of Basic Education (DBE) failed to keep pace with the goals of White Paper 7 ([Tlhabane, 2017](#)) which therefore had to be accelerated to meet the challenges of the 4IR work requirements. Similarly, [Joseph \(2018\)](#) observed that: "On paper, South Africa's investment in basic education and access to schooling looks good. But, behind the numbers, on school grounds and in classrooms across the country, another picture of the education system unfolds; one that is complex, and messy, and not always easy to witness." This could be interpreted as manifestation of failure to understand e-Education and e-Learning policy intents by the DBE's directorates and implementers (teachers).

The foregoing seems to resonate with [Vandeyar \(2015\)](#) whose findings reveal that e-Learning officials from both the district and the province were inadequately equipped with the implementation procedures of the national e-Education policy nor their specific roles and responsibilities were clearly outlined. Hence they failed to interpret policy intentions which led to ill-supported schools and teachers-ineffective implementation of the e-Education policy. Thus, there is a need for urgent and thorough evaluation programs to be embarked on to ensure informed induction, orientation and training of DBE officials on computer technology integration policies.

Referring to the importance of the adoption of new and ever-changing technologies, [Joynes, Rossignoli, and Fenyiwa \(2019\)](#) propounded that, in order to satisfy world market of work, there is an urgent need to revolutionize the teaching and learning pedagogical platforms by blending academic and vocational educational competencies and skills. Seemingly, in this regard the Organization for Economic Cooperation and Development ([Organisation for Economic Cooperation and Development \(OECD\), 2015](#)) congruently highlighted that through project and inquiry-based approaches, enhanced through digital technology integration, hands-on activities and cooperative learning can be achieved. Furthermore, [Joseph \(2018\)](#) stressed that technology and behavior change constitutes two issues that enhance world improvement. Thus, the informed use of computer technology can promote a scenario of teaching and learning congruent with 4IR. What is encouraging is that South African teachers strongly perceive computers as an essential tool to enhance authentic instruction ([Mathevula, 2015](#)) which translates into better learner performance.

However, teachers, especially the 'older generation cohort' face the challenge of being 'fearful' of the computer technology usage in the classroom hence the need for meaningful training in the integration of computers into teaching and learning ([Umugiraneza, Bansilal, & North, 2018](#)). These teachers need on-going meaningful on-the-job training on computer integration for teaching and learning. Similarly, making reference to importance of teacher professional development in accordance with dynamic reforms in curriculum in South Africa, [Govender \(2018\)](#) stressed that since curriculum change is inevitable, its success ultimately depends on continuous development of teachers. Thus, the urgent need is felt to best support teachers to develop essential skills for the twenty first century. Specifically, with regard to the importance of computer integration in the teaching of mathematics in South African schools, [Umugiraneza et al. \(2018\)](#) asserted that it is the teacher's beliefs about principles of learning and teaching that make a difference to student learning. Therefore, comprehensive teacher training can suffice mitigation of the challenge of teacher-fear. In addition, [Baturay, Gökçearsan, and Ke \(2017\)](#) posited that perceived ease and usefulness of computer tools and their ultimate usage, to enhance instruction and active learning, depends on teacher's knowledge and skills.

Current research ([UNESCO, 2018](#)) points out that, in terms of the instructional methodologies, there was a growing global consensus that 21st-century learning strategies looked rather different from the preceding eras. Despite extensive research on impact of computer usage in teaching and learning across the world, teachers appear

to be using computer tools on superficial extents. With regards to the aforementioned enlightenment, Bhalla (2013) was quoted positing that “teachers had either rarely or never used computers for presenting entire lesson, students’ classroom presentations, tutorials, sharing information with parents, publishing homework, giving tests to students.” Similarly, in a Snapshot survey on ICT integration in South African schools, Vandeyar (2015) revealed that there was very little-known information on the practical enforcement of technology integration in the classroom and this results in irregular and insignificant computer usage for teaching and learning. More so, research carried out in South Africa reflects some form of biased use of computers towards some ‘special’ subjects like mathematics and science at the expense of the rest of the curricula. This is evident through the roll-out of the Khanya project of 2007 whose aim was to provide appropriate technology to improve curriculum delivery to all grade 12 learners in Western Cape (Smith & Hardman, 2014). Thus, it is necessary not only for effective use and integration of technology across the curricula but also for continuous quality training and sustained support for teachers in line with world technological advancements.

Ngwu (2014) indicated that computers are only effective when their use complies with curriculum requirements, teachers’ computer-self-efficacy, and appropriate plans that should be constantly in place to enhance learners’ academic performance in line with 21st century’s ever-changing technological challenges. Thus the researchers propound that careful attention be paid to current teacher training models; models of which should be consistently evaluated and modified in light of surfacing discrepancies to suit current changes in accordance with requirements of advent of the 4IR. The researchers’ view remains similar to the revelation that lack of self-efficacy of the teachers (Nkula & Krauss, 2014) determines degree of computer usage. Even if computers are supplied in abundance in schools, that cannot guarantee meaningful use of computers for instruction. Subsequently, lack of computer skills (Msila, 2015) cannot enhance educational transformation in line with current world of work. Therefore, ill-trained teachers cannot make informed decisions regarding the choice of suitable websites, specifically when and how to use them. To ameliorate challenges of teacher computer illiteracy, Davidson, Richardson, and Jones (2014) suggest provision of effective technology integration training for teachers in order to enhance the embedding of computer use in improving instruction which may culminate in better learner performance.

3. THEORETICAL FRAMEWORK

Concurring with Siemens’ (2005) theory of Connectivism in the digital age, today’s learning process involves connecting, nurturing connections and information sources taking into account the nature of the recipients (Aggrawal, 2004) i.e. learners psychological attributes. Literature reviewed highlights that partnerships among peer-learners in collaboration with their teachers are enhanced through computer technological tools such as internet, Learning Management Systems (LMS) e-learning facilities, etc. These tools are indispensable for upskilling the human capital and preparing them to face the 4IR challenges and 21st century work requirements. Emphasizing importance of technology integration in education, Sailin and Mahmor (2018) asserted that 21st century learners use technology to learn content and skills so that they will know how to learn, communicate, innovate and collaborate. However, the researchers strongly feel that educational psychology domain needs to be harmonized with technology and content domains to ensure authentic learner-performance. The rationale for this phenomenon is that as adolescent-learners surf through the internet tools they need diligent teacher-informed guidance so as to utilize relevant websites in order to avoid distraction of teaching-learning process.

Given the foregoing highlights, this study employed the Technological Pedagogical Educational Psychology and Content Domain (TPEPCD) model. This model was adapted and further developed from the widely and commonly used Technological Pedagogical and Content Knowledge (TPCK) model (Mishra & Koehler, 2006). Educational Psychology (EP) domain was the extension of TPCK based on the rationale that knowledge of cognitive, affective and psychomotor levels of learners allows the teachers to craft their lesson content, instructional strategies and technological supplements taking cognizance of learners’ diverse psychological developments. In

corroboration (Seifert & Sutton, 2009) asserted: “Whether in the past or in the present, students learn at their unique pace, show unique personalities, and learn in their own ways.” For example, learners in grade 8 would learn better if their teacher’s pedagogical approach enshrines technological gaming activities unlike when teaching grade 12 learners who are regarded more mature psychologically. Therefore, in order to integrate TPEPCD model in teachers’ training, it is necessary to emphasize on the levels of psychological development of learners. This further allows teachers to diligently select and vary technological materials that suit each age cohort of learners. Figure 1 below illustrates TPEPCD model.

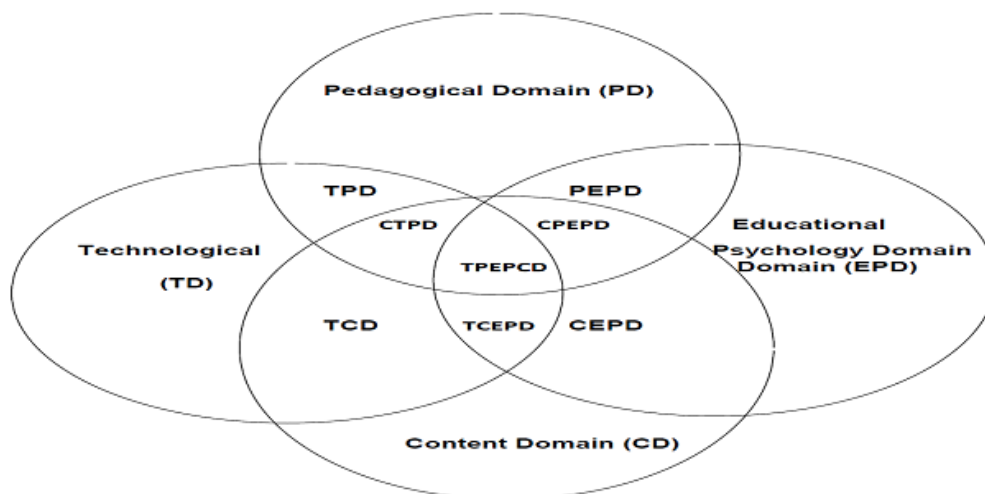


Figure-1. Technological pedagogical educational psychology content domain model (TPEPCD): adapted from Mishra & Koelher (2006).

KEY

- TCD: - Technological Content Domain.
- TPD: - Technological Pedagogical Domain.
- PEPD: - Pedagogical Educational Psychology Domain.
- CEPD: - Content Educational Psychology Domain.
- TCEPD: - Technological Content Educational Psychology Domain.
- CTPD: - Content Technological Pedagogical Domain.
- CPEPD: - Content Pedagogical Educational Psychology Domain.
- TPEPCD: - Technological Pedagogical Educational Psychology Content Domain.

Therefore, integration of this model in teachers’ training institutions could provide teachers with confidence in integrating computer technology in teaching in a more meaningful manner. No matter how good a teacher would be in terms of subject content, one fails to teach effectively if one does not command current teaching strategies, which are pedagogical and technological techniques required in the Educational Psychology domain.

4. METHODOLOGY

The interpretivist paradigm was employed in this study because it allows profound exploration of several areas of human behavior (Denzin & Lincoln, 2018; Mohajan, 2018) for the development of educational organizations; it promotes deeper understanding of people’s perceptions, feelings, attitudes and experiences pertaining to a particular phenomenon under study (Denzin & Lincoln, 2018; Kumar, 2014). The researchers chose to use this paradigm because of its advantages grounded in the assumption of social interpretations by individuals (Bertram & Christiansen, 2016; Bricki & Green, 2017) which presumably yields usable detailed information about teachers’ perceptions on computer use for instruction.

Using a case study design (Aurin, Heath, & Howells, 2016) of Pinetown district secondary schools, semi-structured one-on-one interviews were used to explore teachers' perceptions about using computers as a tool in teaching and learning in secondary schools. According to Bertram and Christiansen (2016) interviews constitute a procedure of data collection, which are a structured and focused conversation where the researcher intends to have a specific research question answered by the participant(s). Semi-structured teacher interviews were triangulated with participant observation, carried out through classroom observations, to substantiate information sought through

interviews. Each teacher was observed teaching with the aid of computer tools so as to ascertain the claimed ideas that computers usage for instruction enhances motivation, collaboration and keeps learners engaged on given tasks (Edutopia, 2014). Apart from the interviews, classroom observations allow the researchers to see the phenomenon under study from another angle enabling them to cross-validate the findings about computer usage for teaching and learning.

4.1. Participants, Sampling and Setting

The targeted population comprised secondary school teachers from Durban North West circuit of Pinetown district in KwaZulu Natal, South Africa. Teachers from KwaMashu Central and Mafukhuzela Ghandi Clusters constituted the specific population. As recommended by Bertram and Christiansen (2016); Edmonds and Kenndy (2017) purposive sampling procedures were used to select three schools by virtue of having and assumedly using computers for teaching and learning. Two schools were from KwaMashu and one was from Mafukhuzela Ghandi. These schools constituted communities of different socio-economic backgrounds, which allowed the researchers to make comparison in terms of teachers' perception. In order to elicit pertinent information about the phenomenon under study, the researchers, sampled 2 teachers from each school. Therefore, the sample constituted 3 schools and 6 teachers.

4.2. Procedures and Data Collection

According to Bricki and Green (2017) and Denzin and Lincoln (2018) semi-structured interviews and participant observation procedures were followed to solicit data from the participants. Permission was sought from schools and each participant was informed of the purpose and significance of the study. Before the commencement of data collection process, consent forms were issued and got signed. The interviews and classroom observations were done consecutively, that is, after the interview, one lesson of the participating teacher was observed on the same day to save time and substantiate what was said in the interviews. Triangulating interviews and classroom observations allowed the researcher to improve validity and trustworthiness of the findings. Supporting the idea of triangulating interviews with observations, Bertram and Christiansen (2016) suggests that helps in documenting what teachers often teach in different ways. Each interview session was voice-recorded, transcribed verbatim to allow its systematic analysis, thematically in this case. Lessons were also observed making use of a lesson-observation schedule to enhance capturing of pertinent information. Each interview lasted for about 20 minutes to 1 hour depending on the amount of information the participant was willing to provide. A one-hour lesson was observed per teacher, which resulted in 6 lessons observed for six hours.

4.3. Data Analysis

Thematic analysis technique was used taking cognizance of the theoretical framework under which the study was grounded and the research question (*what are teachers' views on using computers?*) was framed to extract salient themes from both transcribed data of the interview and the classroom observations. As advised by De Vos, Strydom, Fouche', and Delpont (2011) the researcher started data analysis and interpretation as soon as the first interview and observation data were collected. Thematic analysis of data involved in-depth analysis of transcripts, identifying significant themes and putting them together in accordance with their characteristics (De Vos et al., 2011). The analytic process was done to note differences and similarities; clustering them until no new categories emerged, eliminating duplication as much as possible. Data were then put into thematic charts so that themes could be checked across, promoting more meaningful mapping and interpretation of concepts, relationships, associations and significant patterns. Surfaced themes were presented in prose form for final reporting.

5. FINDINGS AND DISCUSSIONS

Findings of this study are presented and discussed in accordance with the teachers' perspectives on the use of the computer tools across secondary school curricula. The findings comprise particularly the views of teachers with regard to computer literacy levels, availability of computers resources in their schools and multi-stakeholder support. These views were examined specifically considering the advent of the fourth industrial revolution (4IR) and its challenges thereof. The analytic process of the semi-structured interviews adopted the following pattern: the sampled school was identified by the first letter and the participant teacher by the immediately following letter, i.e., teacher AB meant the school was A, and the teacher in school A was B. The tendency of teacher pseudonymity was consistently followed by the researcher to uphold ethical requirements and to ensure anonymity and confidentiality of the participants.

The following two themes were extracted through semi-structured interviews and participant observation, meant to address objective of the study: (1) computer usage as a tool towards teaching and learning and (2) challenges and stakeholder support.

5.1. Computer Usage as a Tool towards Teaching and Learning

With regard to the importance of use of computers for teaching and learning, all six participating teachers concurred that their use enhanced authentic teaching and learner performance. Hence, all participants concurred that effective use of computer tools assisted learners to learn better and more efficiently (Milla et al., 2019) and enabled them access to more up-to-date information. It provided flexible and accessible learning opportunities for all, inside and outside the classroom. In line with authentic learning for the 21st century, Lombardi (2007) asserted: "Most teachers consider learning-by-doing the most effective way to learn." Similarly, teacher BA concurred with the rest of participants mentioning that: "...learners are different; some of them are visual learners; so for their understanding, they need visuals." However, teachers expressed that they were faced with a challenge of lack of computer literacy skills to efficiently use computers to enhance learner performance. In line with the above revelation teacher CB corroborated: "I don't have any qualifications; even though, I do have basic knowledge of how to use the computer, I didn't go to any training."

Teachers indicated much frustration by 'crush' workshops they were subjected to, thus regarding such computer integration workshops as meaningless. For instance, teacher BB lamented: "We need to be taught basic computer skills; we received a one-week workshop only; but they did make follow-up this year, just once off 'one day'. 'How far'? They just came to check 'how far we have gone'. How far have we gone, where? It was just that day" [Teacher BB]. Teacher BB really expressed dismay due to the inadequate training and a one-day follow-up evaluation program after its launch, stressing that it could not make any difference. Similarly, in his study on ICT use in Limpopo province, Mathevula (2015) highlighted: "...while some teachers had received some form of ICT training, it was evident that such training has had minimal impact on the abilities of teachers to use ICT in their teaching..." Teacher AA stressed that because teachers lacked capacitation, meaningful training can make a difference in enhancing effective use of computers. In this regard teacher AA suggested: "Training, training, and training. I can't stress that anymore; educators need to be trained and provided with the tools; the biggest problem is being able to use whatever is being provided; so that's what I was trying to say when I was saying training, training, and training." [Teacher AA]. Therefore, from the aforementioned perspectives meaningful computer integration models could mitigate insignificant use of computers in the advent of the 4IR.

In line with TPEPCD model and as advised by Milla et al. (2019), digital technology integration "helps students learn better, more efficiently, and enables access to more up-to-date information" and provides flexible learning opportunities for all students, inside and outside the classroom. However, teachers warned that if learners used computer tools outside school premises, be it home or libraries, they needed clinical parental support and guidance, depending on learner-psychological development. Accordingly, teacher BA postulated: "I always work in

liaison with parents and guardians of my learners if I assign learners work that requires use of internet tools outside school grounds; learners are like that; they get tempted to access even pornographic sites, which disrupts their homework” [Teacher BA].

Similar to the findings of Edutopia (2014) and Baturay et al. (2017) use of computers ameliorates discomfort caused by overcrowding classes as well as learner disciplinary problems. In corroboration: *“When you come and observe me teaching you’ll see what disciplined learners they are because everybody is watching.” [Teacher BA].* Above all teacher AA concurrently highlighted: *“Mark-wise, I’ve seen a very steady growth; there’s a learner that has improved from 30% to 60% in Mathematics paper 2, to be specific.”* Teacher AA’s revelation resonates with Smith and Hardman (2014) findings that the ‘use of computers motivates learners and enables access to hard-to-reach-learners’.

Therefore, computer integration in teachers’ training colleges needs to be meaningfully institutionalized and properly monitored during teaching practice so as to meet challenges coming with the 4IR work requirements. In this regard teacher BA was further quoted postulating that: *“Use of computers as a pedagogical tool just sparks interest in the learners; and especially as we are approaching the Fourth Industrial Revolution, one needs to be creative and innovative when teaching.”* Generally, South African teachers are aware of the importance of computer usage for teaching and learning; nevertheless, they cried foul over the lack of self-efficacy due to lack of training, and insignificant on-the-job capacitation, hence emphasis on meaningful integration training in computer uses. In line with above, one participant teacher indicated: *“I took a course about four years back (year 2014) at Imvana Training College. It was a private thing. But before that I was in another school, there was a course that we took. It was actually ‘sort of a workshop’ in Stanger so we went there; it was DOS just to be able to type, understanding the basics of the computer; it was just out of my own interest.” [Teacher BB].* The foregoing enlightenment suggests how computers were scantily used for instruction.

5.2. Challenges and Stakeholder Support

The participants unanimously stated that they faced a plethora of challenges as they endeavor to use computer tools for teaching and learning. Generally, failure to use computers to enhance effective instruction could be a direct effect of poor understanding of e-Learning policies by district officials (Padayachee, 2017) which cascades into them failing to support teachers willing to implement e-Education policy to enhance learner performance.

Scarcity of computer resources in the schools resulted in *superficial* and *irregular* use of computer usage. The challenge of scarcity is exacerbated by another challenge of rampant thieving and wreaking havoc in the sampled schools. Theft problems are a commonplace in all schools. In this regard teacher CA corroborated: *“Vandalism is a challenge; we had 25 computers, and all of them were stolen; and Vodacom gave us the tablets; they came for tablets (third attempted robbery); fortunately, we realized before they took them out.”* Another participant teacher from school A highlighted similar challenges revealing that: *“The biggest problem, in the school, is safety of the computers. So at the moment I always take the tablets with me home...because I feel it’s not safe to leave them here in school because the office rooms have been broken into several times, and more than 30 computers were stolen from the computer room.” [Teacher AA].* Due to the challenge of ongoing theft computers were found to be superficially used. Theft of computers was also reported in Gauteng province, South Africa. The *Sowetan* newspaper (16 January, 2019, p. 1), reported that Menzi primary school in Tsakane, Ekurhuleni, was “wiped” of all of its technological resources, i.e. all the computers and over 180 tablets, intended to be used for teaching and learning, were stolen. However, despite the foregoing challenge, teachers could not use the few computers available because they lacked efficacy (Mathevula, 2015) to optimize them to the advantage of the learners’ academic achievements. Teachers expressed lack of interest in capacitating themselves due to DBE’s lack of recognition, provision of incentives and the additional costs they had to incur. Teacher AB stressed: *“We’re 50 educators in school, and there are four or five laptops available. So, you see, one of the most important things is even if have the entire infrastructure that you need in the school, ‘you must want to use it’; I can tell you the amount of money that I spent on my own gadgets that is not provided by the school; because I want to use them, I bought them.”*

Apart from a lack of incentives by the DBE teachers seemed to have developed a negative attitude towards taking initiatives to wanting to take up computer integration training courses. Despite some of the challenges, such as 'lack of vision', on the part of the school management teams, teachers highlighted that there was no significant support received to mitigate on irregular and superficial use of computers. In terms of lack of stakeholder support one of the participant teachers indicated: *"None, whatsoever. Because I've got my own laptop it does not even look as if I am being appreciated for making an effort to buy my own so that I make my job so easy, and to expose my learners to such information, it's not easy. I don't know how to put it, but most of the time I use money to print. The printer is there, but it's kind of like you've to beg and kneel in order to have access. ... I've never heard any parental involvement in terms of them wanting to improve; no support."* [Teacher CB].

Similarly, teacher BA vividly expressed: *"To be frank, one has never received any support from any of the stakeholders mentioned in the question, including the teacher unions themselves. One has not been assisted enough, if at all; but specifically in my case I haven't been supported at all. It seems as if people in these structures, these stakeholders, do not understand in any way the importance of using ICT or using technology in the classrooms; they do not know what importance this has for the lesson and the learners themselves; the environment is not favorable – no computers, no support, nothing. So it's very sad."* [Teacher BA] This highlighted lack of support indicates a phenomenal disadvantage, which inevitably has negative consequences on poorly prepared human capital not in correspondence with the 4IR job requirements. Similarly, Mathevula (2015) suggests that a lack of support on the part of the SMT, and schools' visionary plans on communicating intents of E-Education and e-Learning policies were also noticed in the secondary schools of Limpopo province.

Participant observation was carried out through classroom observations in order to compare and contrast their comments highlighted during interviews. This enabled the researchers to cross-validate the findings and come up with pertinent recommendations. The observation of lessons accentuated the fact that computers were insignificantly used since teachers were the only ones who could manipulate the computer and learners would passively observe the projection on the board. In terms of support during observations, virtually no meaningful support was evident, which is similar to the findings of Eristi et al. (2012). As observed by Bertram and Christiansen (2016) 'teachers often teach in different ways to say how they teach' which henceforward makes the findings of this study more dependable and worthwhile. However, Mathevula and Uwizeyimana (2014) suggested that: "Because teachers are more than willing to use computers in teaching and learning, constant on-going support regarding computer use is obviously needed." Unfortunately, learner-computer ratio observed was zero. Therefore, the researcher concurs with Mathevula and Uwizeyimana (2014) who had concluded that scarcity of computers and the lack of support in terms of provision of computer tools, teachers could not perform the way they would have intended to.

6. CONCLUSION

The study revealed that the participating teachers acknowledged a serious lack of computer knowledge and skills to meaningfully integrate computers to promote learners' academic performance. This resulted in the insufficient continuous teacher professional development and authentic learning specifically needed for the 21st century. Further findings revealed that computers were insignificantly and irregularly used across the curricula due to scarcity of computers, which was caused by rampant theft in the sampled schools. In addition, the participants experienced a lack of incentives from the Department of Basic Education (DBE) towards providing initiatives related to computer integration training courses and no significant support from the school management team to mitigate irregular and superficial use of computers. A lack of vision on the part of the School Management team revealed that certain subjects relied on the availability of computer resources, such as Computer Applications Technology. Such subjects could be expunged from the school curricula and hence urgent attention is needed from the DBE. These findings also highlight the fact that the challenges experienced by teachers pose a serious threat about the state of readiness of schools for the 4IR.

This small scale study employed the interpretivist paradigm purposively selecting three schools from which six teachers constituted the research sample. Although the study triangulated semi-structured interviews and participant observation to enhance cross-validation of data sought, the study findings cannot be generalized to portray wholesome picture of the population across the country. Nevertheless, the study managed to collect sufficient data through interviews and classroom observations and thematically analyzed data to make the findings valid, dependable and transferable.

In light of these findings this study recommends that more meaningful and practical integration of computer technology should be made compulsory in all teachers' training institutions. In line with this recommendation, Industry 4.0 Teachers' Professional Repertoire model entitled: "Technological Pedagogical Educational Psychology Content Domain (TPEPCD) model" could be implemented in all teacher training colleges. Furthermore, the study recommends that more profound research should be carried out on pros and cons of e-Learning in education of developing countries in the event of global lockdown due to outbreak of unforeseen diseases such as Covid-19, thus the need to rethink how best to support our teachers in acquiring twenty-first century skills is critical.

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