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The extent of South African schools' preparedness to counteract 4IR challenges: learners' perspectives

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Abstract

The aim of this paper was to explore learners' perspectives on how their schools are preparing them to prosper in the Fourth Industrial Revolution (4IR) era which is powered by Artificial Intelligence (AI). Taking cognisance of the learners' perspectives on how South African schools are preparing them is essential for enabling the education fraternity to ascertain its level of effectiveness and efficiency hence improving its state of readiness to face the challenges of the 4IR. Therefore, the exploration of the level of preparedness, in line with 4IR challenges, can assist educational policy makers and planners to be more proactive and craft mechanisms to ameliorate the obstacles and discrepancies inhibiting the acquisition of the 21st century educational competences and skills. Employing a qualitative paradigm, semi-structured focus group interviews were used to solicit data from a sample of 30 grade 10 and 11 learners. Findings reveal that computer technology was irregularly and insignificantly used indicating that South African schools are highly ineffective in dispensing grade-appropriate skills thus producing ill-prepared learners to prosper in the 4IRworld of work.

KEYWORDS: Artificial Intelligence, Fourth Industrial Revolution, level of preparedness, Technology Acceptance Model

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1. Introduction

Preparedness for the future is crucial in all education systems if the young generation is to prosper in this era characterised by fusion of disruptive technologies. Schools in South Africa need to equip learners with critical computational thinking skills for them to function effectively in the 21st century. If all South African schools are to take advantage of the advent of the Fourth Industrial Revolution (4IR) they need to be contingent on their abilities to transform the education system to equip the millennial generation with new skillsets such as deep learning and promoting other 'soft' skills (techUK, 2018) in their schools simultaneously ensuring that teachers, across the curricula, are up-skilled in regard to digital-wiseness; encouraged and supported to engage in lifelong learning.

Despite extensive research on 4IR challenges and work requirements (Human Sciences Research Council, 2018) current literature insignificantly highlights the unpreparedness of the South African education system in facing the said challenges hence a glaring manifestation of a gap necessitated this evaluative study. Congruently, in a dialogue conference (10 - 12 December 2018) on Disruptive Technologies and Public Policy in the age of the 4IR, Gastrow (2018) asserted that the 4IR national policy framework's purpose was to harness the power of the 4IR towards the achievement of South Africa's developmental aspirations, which in a way focuses on how to prosper with such a global phenomenon (4IR) that is powered by ever-changing digital technology without putting to the fore the findings pertaining to the extent of preparedness of South African education system to counteract such

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challenges. Furthermore, having explained what 4IR was, a range of challenges and requirements such as pedagogical adaptation, and increased funding for and investment in resources and infrastructure for technological advancement were identified in adapting to the 4IR (Kayembe & Nel, 2019), 'ignoring' baseline assessment(s) of the situation on the ground that could inform more meaningful direction to materialise. Such conspicuous discrepancies strongly motivated this study to ascertain levels of efficiency and effectiveness of teaching and learning processes in light of the 4IR requirements within the South African context.

Subsequently, the purpose of this study has been, therefore, to explore learners' perspectives on how schools are preparing them for the 4IR, the findings of which can contribute to a better understanding of the shortcomings of the educational dispensations thus allowing stakeholders (policymakers, educational planners and teachers) to take necessary measures towards improving the quality and use of digital technologies within the South African schooling systems. Particularly views of learners with regard to computer literacy levels, availability of computer resources in their schools, and stakeholder support was examined taking cognisance of the advent of the 4IR world of work and challenges. The aim was to ascertain levels of preparedness of our secondary schools in creating conducive learning conditions for the millennial generation to prosper in the 4IR.

2. Background

The impetus for digital technological change in education is so powerful that new perspectives on teacher training (Department of Basic Education, 2019; Mihaescu & Andron, 2019), more especially in relation to the pedagogical curriculum, has to be adopted in quest for a new and responsive skills sets, which are considered vital to adapt to the world of constant change. When emphasizing inclusion of coding alone in the South African education system, Retief (2019) asserted that it would not sufficiently and constructively prepare South African learners to face the 4IR challenges. Regarding effective learner-preparation Retief (2019) further revealed that South African schools were, indisputably, producing school-leavers ill-equipped to operate effectively and efficiently in a digital world.

Nevertheless, making reference to the realities of the 4IR, Butler-Adam (2018) stressed that virtually all workplaces required adaptable people whose jobs are reimagined and aligned alongside digital technological developments. Therefore, subsequent to the above postulation, in concurrence with Alvin Toffler (1970) as cited in the South African News Centre (N.D) that the illiterate people of the 4IR era would be those individuals who cannot learn, unlearn and relearn. With regard to the foregoing assertion the attitude of life-long learning needs to be inculcated in our schooling systems as knowledge is constantly changing exponentially. Therefore, our schools should prepare learners for the changing technologies in the digital world and understand how (De Angelis et al., 2019) they can acquire new and relevant skills, which they should employ in solving challenging problems creatively and collaboratively in accordance with 4IR requirements.

Given the aforementioned enlightenment, Mihaescu and Andron (2019) further stressed that teachers are forced by the rising volume of information and by the changes to adapt and question paradigm shifts such as deeper digital educational knowledge and learner collaboration as well as learner feedback for better joined learning pathways and sharing of knowledge. In addition:"The fourth industrial revolution represents entirely new ways in which technology becomes embedded within societies and even our human bodies. Featuring technologies such as artificial intelligence (AI)…the 4IR is poised to change the face of the world economy in the 21st Century" (techUK, 2018, p. 2).

Similarly, the Adendorff et al. (2018) asserted that the 4IR represents fundamental disruptions in the way we live, work and relate to each other resulting in change, inevitably, occurring in either desirable or undesirable ways. Nevertheless, in this regard, techUK(2018) postulated that only the nature of those jobs changes, which somehow purports that jobs are not going to be completely new but modified, hence education is instrumental in preparing tomorrow's workforce accordingly. Similarly, McNully (2018) posited that the growth of digital technologies and the extent to which we rely on them in the workplaces dictates that learners need to acquire meaningful technological skills. Accordingly, to accomplish this benchmark in South Africa we need to see a fundamental shift in education moving towards sharing a common goal and working together with all the relevant stakeholders in driving technological innovations in schools.

Taking cognisance of the aforementioned paradigm shifts in the job market, in its submission to the Education Select Committee of June 2018, techUK posited that up-skilling of current employees is fundamental since about 63% of jobs in the United Kingdom then required above-basic level digital skills hence the need for home-based strategies. Given the fact that such assumptions could be translated into reality, where will our South African secondary school graduates stand, given the current 'rudimentary' and 'archaic' systems through which they are being taught, especially in previously disadvantaged rural schools. These schools are characterised by having scarce or sometimes even no computer technologies in place; no broadband facilities available in most public schools; hence current research reveals that learners cannot even carry out the simplest computer operation, as revealed by Retief's (2019) study in the face of the 4IR. Given the fact that as a developing country which is still dependant on labour intensive extractive industries (McNully, 2018), South Africa is at risk of not amply taking

advantage of the rapid advancement of the new digital technologies hence producing graduates whose skills are not grade-appropriate to face challenges of the 4IR. Regarding the foregoing enlightenment it is conspicuous that teachers today are faced with a plethora of challenges, however they have enormous benefits of enhanced interconnections powered by internet.

As knowledge and skillsets are changing exponentially there is dire need for critical foresight to ameliorate the challenges that inevitably come with the 4IR. Emphasizing the importance of lifelong learning by the current workforce in light of the looming changes coming with the 4IR, techUK (2018) expressed that the knowledge and skills of the future would be dependent on meaningful on-going training and up-skilling which is almost similar to Sarayreh, Khudair and Barakat's (2013) assertion, as cited by Amino, Bosire and Role (2014), that for meaningful continuity and growth, schooling organisations should remain self-organising-criticality and adaptively relevant to the scheme of things in their operational environment.

Therefore, in order to prosper in the 4IR there is need to engage current workers, in the teaching fraternity, in meaningful on-the-job up-skilling programmes because what could be relevant knowledge and skills today could be regarded obsolete in a decade or two (Siemens, 2004; 2005) as knowledge transforms exponentially. Particularly, in the context of national e-education policies, the South African White Paper 7 (Department of Education, 2004), global education super-highway is constantly revolutionising that is being driven by the changing nature of work and new global partnerships alongside the realities of the information age. Subsequently, in this policy the Department of Basic Education (DBE) proved to articulate well the way forward in terms of implementation of e-education and e-learning policies. However, its intentions did not come to fruition as e-education directorates 'failed' to induct implementers (teachers) due to lack of 'appropriate' knowledge themselves about the policy intents as they perceived themselves as mere 'conduits' to these policies (Vandeyar, 2015). Nonetheless, the then Minister of the Department of Basic Education, Doctor Naledi Pandor, was quoted, in the White Paper 7 of 2004 confidently positing that the e-education policy's goal was that all South African learners were supposed to be ICT capable by the year 2013 (Department of Education, 2004). Contrastingly, learners lacked the necessary computer competence to meaningfully use computer tools for authentic instruction and ultimate learner academic performance by the year 2015, which is a painful revelation (Mathevula, 2015) after two years of the set target.

It is therefore clear that there is need for more to be done to ensure schools, partners in education and employers meaningfully collaborate on preparing the future workforce for the 4IR requirements. For example, SchoolNet South Africa is a dedicated partner in South African education system whose core business is to provide teacher professional development in line with effective digital learning thus improving the existing pedagogies so as to promote higher order thinking skills and encourage spirit of enquiry among learners (Department of Basic Education, 2019), although its coverage is still negligible, especially in previously disadvantaged schools.

A coordinated effort is essential because it can yield positive outcomes only with transformational leadership envisaged, unconditionally, for pursuance of a practical curriculum in which digital technology is enforced across the curriculum. In concurrence techUK (2018) emphasised the importance of empowering local schools, learning-providers and other partners in education to ensure that students are workplace-ready. This approach can be adopted and modified to suit domestic challenges in light of 4IR requirements. Hence it is crucial to come up with domestic paradigm shifts in terms of e-Education and e-Learning policy formulations. For example, all eThekwini municipal libraries have internet facilities accessible by all community dwellers such as adults and school-going children, for 'free', as a crucial inroad towards catching up with the 4IR digital requirements and challenges.

As a government it is incumbent upon us that rote/recall learning and examinations are avoided for a transformational education system that promotes and rewards application and adaptability of knowledge and skills in light of 4IR challenges. Collectively, the aforementioned studies indicate that there is a need for the South African Department of Basic Education to take seriously research and task independent education commissions that should investigate the current education dispensation strategies from Early Childhood Development (ECD) to lifelong learning so as to ensure learners gain grade-appropriate knowledge and skills that allows the young generation to prosper in the 21st century.

3. Theoretical Framework

This study is grounded in the Technology Acceptance Model founded by Davis (1989), which puts to the fore that the attitude of learners is seen to be playing a pivotal role in determining the level of usage of digital technology (Gokcearslan, 2017) hence the adoption of the following model whose cascading relationship is illustrated as follows:

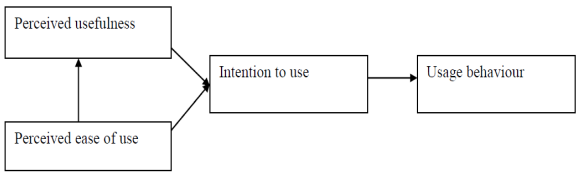

Figure 1 - Adopted: Technology Acceptance Model (Davis, 1989).

Perceived ease of use affects perceived usefulness, which cascadingly affects the intention to use technology and the learners' ultimate usage behaviour (Gokcearslan, 2017). The rationale for adopting this framework was based on the fact that for learners to effectively use technologies, which blur the lines between physical, digital and biological spheres (McNulty, 2018), they need to be exposed to schooling system that is technologically savvy that effectively integrates the usage of new and emerging technologies. In light of 4IR requirements, powered by AI learners need to perceive and comfortably use computer technologies that are constantly changing with passage of time.

4. Methodology

The qualitative paradigm was employed in this study as it promoted detailed and a deeper understanding of participants' perceptions, feelings and experiences pertaining to the phenomenon under study (Kumar, 2014; Denzin & Lincolin, 2018). This paradigm was specifically selected because of its advantages grounded in the assumption of social interpretations by individuals (Bertram & Christiansen, 2016; Bricki & Green, 2018), which presumably allowed the researchers to yield usable detailed information about learners' perceptions and experiences on how they were getting prepared, in their school, to face the realities of the 4IR.

Making use of semi-structured focus group interviews, a case study design was used to promote deeper exploration of learners' perspectives about how conducive their schools were in dispensing grade appropriate knowledge and skills; hence semi-structured focus group interviews for learners, involved an interpretative and naturalistic approach to its subject matter (Denzin & Lincoln, 2018), were employed. The researchers strongly believed that through the adoption of case study participants' perspectives towards phenomenon under study could be optimally captured.

4.1 Participants, sampling and setting

The targeted population were secondary school learners from Durban North West circuit of Pinetown district in KwaZulu Natal, South Africa. More specifically learners from KwaMashu Central and Mafukhuzela Ghandi Clusters constituted the specific population. Deliberately, (Bertram & Christiansen 2016; Edmonds & Kennedy, 2017) using purposive sampling procedures three schools were selected by virtue of having and assumedly using computer technologies for teaching and learning. Two schools were from KwaMashu central and one from Mafukhuzela Gandhi; these schools constituted communities of different socio-economic backgrounds, which allowed the researchers to draw comparisons in terms of learners' perspectives and their learning experiences. The involvement of learners from diverse backgrounds was intended to increase the generalisability of the study. In order to elicit pertinent information about the phenomenon under study the researchers purposively sampled 30 learners from the 3 schools having computers, i.e., 10 learners (five from grade 10 & five from grade 11) from each school; hence the sample constituted 3 schools and 30 learners.

4.2 Description of Data Collection Procedures and Analysis

Semi-structured focus group interviews were employed, which constituted the instrument for data collection in this study to explore learners' perspectives on how prepared their schools are in dispensing education that allows them to prosper in the 4IR. The underlying assumption was that these interviews would allow learners to provide more and in-depth explorative information about their views concerning use of computer technologies to enhance learning across the curricula.

Due processes and procedures were followed to attain ethical clearance from the institution. Permission to conduct research was sought and obtained from the Department of Basic Education.

Procedurally, the sampled schools were visited prior to data collection to seek for permission and explain the purpose of the study. Consent forms were issued to participants and concerned parents, to accord their children's consent to participate in the study, for completion and signing prior to the actual interview process. Interviews were then carried out on agreed dates with the sampled participants. Each interview session was voice-recorded, taking a duration ranging from 40 to 60 minutes, and then transcribed verbatim to allow its systematic analysis of data thereafter. The researcher provided prompts whenever it was necessary so as to assist the participants to generate accurate responses. Participants validation of their verbatim statements was carried out once the final transcriptions for analysis was available.

Thematic analysis technique was used taking cognisance of the theoretical framework under in which the study is grounded and research question to extract salient themes from both transcribed data. The researcher employed a constantly comparative method of data analysis, that is, subjected sought data analysis to comparison of relationships between concepts and categories noted from rural and urban wards. As advised by De Vos et al. (2011) differences and similarities were clustered until no new categories emerged, eliminating duplication as much as possible. Surfaced themes were presented in continuous form for final reporting. Moreover, the inductive thematic approach, which allows the data to determine the themes, was employed. This technique was chosen because it promotes coding of the collected data without trying to fit it into a pre-existing coding frame or the researchers' analytic preconceptions thus striving to meet the trustworthiness criteria of the research findings. Furthermore, data analysis was conducted in a precise, consistent, rigorous and

exhaustive manner so as to promote credibility of the research outcome.

5. Findings and discussions

The findings of this study are presented and discussed in accordance with the learners' perspectives on how they learnt and benefited from their secondary schooling systems; particularly views of learners with regard to computer technology literacy levels, availability of computers resources in their schools and multi-stakeholder support was examined specifically considering the skillsets demanded to prosper in the 4IR challenges.

The analytic process of the semi-structured focus group interviews takes the following pattern: each learner is coded according to the school, followed by the grade and lastly a letter of the alphabet such as Learner B10B or A11C; hence the school is identified by the first letter and the participant learner by the immediately following letter, i.e., learner B10B means the school is B, and the learner in school B is B and doing grade 10. The tendency of learner pseudonymity was consistently followed to uphold ethical requirements thus ensuring anonymity and confidentiality of the participants.

The themes extracted with regard to level of preparedness of South African secondary schools to face the challenges of 4IR are as follows: *1. Access and frequency of computer technology usage by learners;2. Learner challenges, stakeholder support provided, and recommendations,* which are succinctly integrated in the findings and discussions.

The majority of the participants acknowledged that their schools had computer resources, which when used effectively and equitably across the curricula can enhance meaningful learning, especially in subjects regarded 'most difficult'. Technology use promotes authentic learning (Lombardi, 2007; Edutopia, 2014) as most teachers and learners consider learning-by-doing the most effective way to learn which results in construction of learners' own permanent knowledge. Generally, learners viewed computer technology usage as essentially relevant (Llomack, 2008) and promotes experiential learning (OECD, 2015), resonating Llomack's postulation, as it facilitates hands-on and collaboration in accordance with 4IR job market requirements which constantly change alongside technological changes across the world.

However, more specifically, frequency of computer usage in the sampled schools was solely dependent on level of accessibility to computers in the schools and the local municipal libraries, and/or, the number of assignments given especially in 'hard' subjects where learners perceive that computers can ameliorate in making their research easier. In corroboration: *"I use it approximately five times per month to Google things that I find very hard to do like finding formulas for physical sciences that we sometimes do not get from teachers. I use this tool because I think it makes my research easier." [Learner C10C].*

In congruent with the conceptual framework of this study learners perceived that computer tools can be used easily hence making their research easier to carry out. However, the findings surprisingly reveal that learners infrequently and irregularly access computers due to scarcity of computer resources; scarcity of which is exacerbated by rampant theft wreaking havoc in the delineated area of study. In this regard: *"We are not able to do everything we want to do because of the computer shortages; the lab was vandalised last year, so they stole laptops; I don't know; so many computers. From school, am not even sure we've permission to go to the computer lab; it's only CAT (Communication & Application Technology) learners who've the permission; in the municipal library you've to wait for a couple of hours before you even get the computer. When you book for the computer the time is limited, like 30 minutes; so you can't really do what you want to do because in 30 minutes there's nothing you can do." [Learner C11C].*

The above enlightenment unequivocally indicates phenomenal challenges entailing that our secondary schools are ill-prepared to dispense grade-appropriate education which could allow our millennial generation to prosper in the 4IR. This is similar to Retief's (2019) findings that our schools are "producing school-leavers who are ill-equipped to operate effectively in a digital world" (4IR), although learners have the intention to use technology but due to the limited accessibility and availability their intention is hindered.

Nevertheless, concurring with Zupanec et al. (2013) learner B10C posited that use of computer tools promotes computer assisted learning (CAL) which combines simulations and visualisations that helps abstract concepts to be perceived in a more realistic perspective hence promoting better understanding of the subject content. Learner B10C stressed: *"Well, it is important because it allows things that are in 'motion', like learning about the heart in Life Sciences…it is easier to see how it pumps; you can see it pumping; so I can say it has improved my knowledge. However, the major issue is lack access sir." [Learner B10C].*

In concurrence with the foregoing statements and making reference to technologically enhanced learning about the heart in Life Sciences subject learner C10C corroborated: *"The computer is a good tool to make you see those things; you may see the heart, the muscles. 'Ok these are the muscles. Are standing like this.' You see it's a very important tool…; it's much easier to use the internet, and when you are looking at the teacher, sometimes you just say 'OK, what's she talking about?'; there're some Apps that you can download to learn like Mindset and stuff; they teach you more; they teach you most of it." [Learner C10C]*

Learner C10A concurred that: *"Sometimes when the teacher is explaining things they use words that are not even written down on the book…bombastic*

words…complicated words you can't even understand…hard to pronounce. Even in Life Sciences you can even bite your tongue." Thus, from what learners expressed it becomes evident that computer usage enhances learner academic performance as computers are presumed to stir some form of motivation inspiring them to learn more, consequently increasing their intention to use technology as was alluded to by Gokcearslan (2017) within the selected theoretical framework.

Nonetheless, learners expressed regret over the shortage of computer resources, which is a major challenge in their schools hence limited access cascading into superficial use of computer tools for learning. Furthermore, in this regard learner B11B expressed: *"I've used a computer in the Internet café. In my school I've never touched a computer but I was doing CAT so we didn't have computers; they were stolen so I'd once touched the computer."* Learners further lamented that they come from poor families meaning that learners who only enjoy access to computers in their schools are those doing CAT (Communication & Application Technology) subject and the few whose parents afford to buy them; and/or, live near municipal libraries where they queue to use the few available computers. In light of the aforementioned phenomena (lack of access and computer theft) learner A10E posited: *"Per month I can say maybe I use a computer twice just to find information. Twice or thrice because when the teacher is teaching I don't understand him/her quietly; I just go and use internet. I've email address but I hardly use it yeah." [Learner A10E]*

In this regard learner C11D substantiated: *"When given an assignment of Agriculture to research we don't have computers so I decided to go on a library to research the assignment. In order for me to go there I've to take a taxi. There're people who are doing CAT but me am not doing CAT so computers in the school are only for CAT."* Basically the major challenges highlighted by the generality of the sampled participants are that of lack of computer resources, accessibility to the scarce school computers, long awaiting queues in the municipal libraries and lack of bus fares due to financial constraints. Such scenarios further entrench the digital gap amongst learners and teachers hence application of 4IR Learning Management Systems (LMS) e-learning facilities such as Moodle and ATutor becomes virtually impossible. Nevertheless, in an ideal digitalised environment, learners "have options to choose how and where they want to acquire their…education" (Reid, 2019, p. 14) hence LMS could be regarded as ideal "game changer of traditional teaching and learning" towards more learner-centred strategies.

Participant learners also highlighted lack of stakeholder support, except for a minority of well-to-do parents', as one of the major challenges. *"I get support from my parents who're bought me the laptop and some data every month. I also learn from my peers who teach me from here and there some things that I don't know. I think we don't get enough support from the School Governing Board (SBG) because some computers at the CAT lab are not working; we've to share; so that is a problem. When a teacher gives a practical, you've to share a computer with someone or have to wait for the person to finish then that's when you've to use the computer." [Learner B10A*]. In concurrence learner C11C also highlighted: *"Support from the DBE! Uuh, I've never heard of any support or the principal announcing that 'here are some computers for everyone to use from the DBE'; so I think we've no support from most of the stakeholders whatsoever."* Similar to the observation of (Retief, 2019) lack of support prevalent in our schools translates into production of graduates ill-equipped to operate effectively in this digital world.

The aforementioned enlightenments point to the fact that learners basically do not have any tangible support from the DBE, in the schools studied, which is in sharp contrast with the White Paper 7 of 2004's vision that by the year 2013 all learners in both general education and training (GET) and further education and training (FET) band should be computer literate (Department of Education, 2004). Nonetheless, John Seely Brown (n.d.) cited by Boholano (2017, p. 21) expressed that "today's digital kids think of ICT as something akin to oxygen…they breathe and it's how they live", of which their lives come into demise in the absence of technology that pervades the current teaching and learning processes.

To worsen the situation learners revealed that even their teachers, who should support them in terms of guidance, virtually know 'nothing' about benefits of the computer usage for teaching and learning, which is an evidence of lack of teacher support in terms of in-service or on-the-job-training about computer integration. Because teachers are not meaningfully supported learner C10C, in concurrence with other participants' statements, indicated that they received no meaningful support from their teachers due to the teachers' own incompetence and lack of digital knowledge. The learner succinctly posited: *"They always (teachers) tell us to download previous exam papers. You know, they're always telling us what to do, you know; but they're just telling us, doing nothing showing that they're confused themselves" [Learner C10C].* Therefore, this phenomenon indicates that our schools, besides being ill-equipped with 21st century digital technological tools, they are manned by digitally incompliant human capital hence not prepared to dispense quality education that is in tandem with challenges and requirements of the 4IR. This is in contrast to Boholano's (2017, p. 21) observation that "educational systems must be outfitted with a prerequisite of ICT resources, both hardware and software, and curriculum must be designed to promote a collaborative learner-centred environment to which students will relate and respond."

In light of the foregoing highlighted challenges participant learners suggested that meaningful support be accorded to them in line with e-Education policy

intents. Subsequently: *"The DBE should walk its talk. Not only supply computers for CAT students yet the department expects all of us to perform well in these challenging times of the 4IR; plus before supplying computers they should put security measures in place otherwise all computers they supply will be stolen before we've even used them to be computer literate; so I suggest that in future security levels be improved because our labs are being vandalised everyday by community people." [Learner B11A].*

One of the participating learner seemed to indicate that the problem of theft lay with them (learners) as they divulge inside information that the school had received so many computers hence concurrently posited: *"Well we know that they (learners) do it anyway, so I suggest that in future the security levels should be increased at school so that they'll not just come in and steal the computers." [Learner C11C].*

The above narratives indicate that schools do not have, and/or scarce, computers due to rampant theft hence the suggestion for tight security requirements. Therefore, given this overwhelming computer shortages coupled with serious computer illiterate levels on the part of both the learners and their teachers, the study not surprisingly revealed that computers were insignificantly and irregularly used; hence further to that conclude the level of ill-preparedness of South African schools to dispense grade-appropriate education that can allow the 21st generation to prosper in the 4IR era. However, the findings cannot be generalized to reflect the level of preparedness nationally but could be taken as the true and transferable picture of how schools in the area studied are unprepared to face challenges of the 4IR.

6. Conclusion

The study revealed that learners had very little access to digital technologies in their schools due to scarcity of computers caused by rampant theft thus resulting in them being disengaged and unresponsive hence 'poor' performance. In this regard, because these schools lacked computer resources that could be used across the curricula in line with the challenges and requirements of the 4IR, the study concludes that the sampled schools are not adequately prepared to dispense education that is practically oriented and responsive for current the learners to prosper in the 4IR.

The study also found out that, due to different learner-family economic backgrounds, some learners are more privileged than others in terms of ownership of computer resources, accessibility, and affordability hence disparities in computer literacy, which inevitably increases the digital divide among them. This kind of a scenario makes it very difficult for the teachers, in case of the area studied, to give online assignments that have to be done beyond the school boundaries. Therefore, despite the fact that teachers have to cope with the new requirements and adopt a new role of their teaching behaviour (Abdelrazeq et al. 2016), they are forced to stick to traditional teacher-centred instructional strategies asynchronous to 4IR challenges and world of work.

Conclusively, the state of readiness of the schools leaves much to be desired. In light of the aforementioned findings the study recommends that Department of Basic Education embarks on comprehensive computerisation and digitalisation of all schools so as to try and fulfil the goal(s) of the White Paper 7 of 2004 on e-Education national policy; promoting equity and equality across provinces thus allowing teaching and learning process to benefit from use of LMS facilities that allow both learners and teachers to interact and collaborate defying distance and time constraints.

The study only employed qualitative paradigm purposively selecting three schools from which 30 learners constituted the complement of the research sample. In this regard the study findings cannot be generalised to portray wholesale picture of the population across the country. Despite the foregoing enlightenment the study managed to collect sufficient data through in-depth semi-structured focus group interviews with learners and systemically analysed it thus making the findings valid, dependable and transferable.

References

Abdelrazeq A., Janssen, D., Richert A. S., & Jeschke S. (2016), Teacher 4.0: Requirements of the Teacher of the Future in Context of the Fourth Industrial Revolution, ICERI 2016, November 16, DOI: 1021125/iceri.2016.080.

Adendorff C., Lutshaba U & Shelver A. (2018), Policy Implications of the 4th Industrial Revolution for the Cultural and Creative Economy, Measuring & valuing South Africa's Cultural & creative economy. Republic of South Africa, Department of Arts and Culture –South African Cultural Observatory.

Amino C. J., Bosire J. & Role E. (2014), Theoretical Underpinnings of Curriculum Change in Developing Economies: Is Complexity Theory the New Wine in Lewins' Old Wineskin? URL: http://dx.doi.org /10.6007/IJARPED/v3-i3/950 (Accessed on 6th April 2020).

Bertram C. & Christiansen I. (2016), Understanding Research: An Introduction to Reading Research, Pretoria, Van Schaik Publishers.

Bricki, N., & Green, J. (2017). A Guide to Using Qualitative Research Methodology. MSF Field Research.URL: http://hdl.handle.net/10144/84230. (Accessed on 6thApril 2020).

Boholano H. B. (2017), Smart Social Networking: 21st Century Teaching and Learning Skills. Research Pedagogy, l7(1), 21-29.

Butler-Adam J. (2018), The Fourth Industrial Revolution and Education. South African Journal of Science, 114(5/6). DOI: https: //doi.org /10.17159 /sajs.2018/a0271. (Accessed on 6thApril 2020).

Denzin, N. K., & Lincoln, Y. S. (2018), The SAGE Handbook of Qualitative Research. (5thed.) Los Angeles, London, New Delhi, SAGE Publications.

Department of Basic Education (2019), 19th Annual National Teaching Awards, 2019 NTA Booklet, 25 years of Freedom and Democracy, Republic of South Africa.

Department of Education (2004), White Paper on e-Education, Transforming Learning and Teaching Through Information and Communication Technology (ITCs), DoE White Paper 7.qxd 7/17/2006. Government Printing Works, No. 26762, Pretoria.

De Angelis M., Gaeta A., Orciuoli F., Parente M. (2019), Improving Learning with Augmented Reality: A Didactic Remediation Model from Inf@nzia DigiTales 3.6. Journal of e-Learning and Knowledge Society, 15(3), 287-300. DOI: 10.20368/1971-8829/1135032

De Vos A. S., StrydomH., Fouche' C. B. & Delport, C. L. (2011), Research at grassroots, (4th ed.), Pretoria: Van Schaik

Edmonds W. A. & Kenndy T. D. (2017). An Applied Guide to Research Designs: quantitative, qualitative and mixed methods. Los Angeles, London, New Delhi, SAGE Publications, Inc.

Edutopia. (2014). Why Integrate Technology into the Curriculum? The Reasons are Many, There is Place for Tech in Every Classroom, WHAT WORKS IN EDUCATION. The George Lucas Educational Foundation. URL: http//www.edutopia.org/technology-integration-introduction. (Accessed on 7th April 2017).

Gastrow M. (2018), Policy options framework for the fourth industrial revolution in South Africa: An output of the SA-EU Strategic Partnership Dialogue Conference, Disruptive technologies and public policy in the age of the Fourth Industrial Revolution. Human Sciences Research Council, South Africa, 10 - 12 December 2018 CSIR International Convention Centre, Pretoria.

Gokcearslan S. (2017), Perspectives of Students on Acceptance of Tablet and Self-Directed Learning with Technology. Contemporary Educational Technology, 2017, 8(1), 40-55.

Human Sciences Research Council. (2018), Digital disruption – The Impact; Social innovation – the Need to Consult; young people –Transitioning out of Poverty. HSRC Review 16(4), 2-41.URL:http:/ /www.hsrc.ac.za/uploads/pages /1278/ HSRC %20 Review%20December%202018_fa.pdf . (Accessed on 6thApril 2020).

Kayembe C. & Nel, D. (2019), Challenges and Opportunities for Education in the Fourth Industrial Revolution, 11(3), 79-94.

Kumar, R. (2014). Research Methodology: A step-by-step guide for beginners. 4th Edition. Los Angeles, USA: Sage.

Lesufi P. (2017), Educating Our Childrenfor the Fourth Industrial Revolution.2016/17 vote 5: Education Annual Report Debate, Mr Panyaza Lesufi, Member of the Executive Council for Education, Gauteng legislature – 30 November 2017.

Ilomaki L. (2008), The effects of ICT on school: Teachers' and students' perspectives. University of Torku, Finland. URL: https://oa.doria.fi/bitstream/handle/10024/42311/ B314.pdf?sequence=3. (Accessed on 6th April 2020).

Lombardi M. M. (2007), Authentic Learning for the 21st Century: An Overview. Edu-cause Learning Initiative, Advancing Learning through IT Innovation. URL: http://www.educause.edu/ir/library/pdf/ELI5014.pdf. (Accessed on 15thJanuary, 2019).

Marlin D. (2018), Millennials, this is how artificial intelligence will impact your job for better and worse. Forbes, 2018 January 16,URL: https://www. forbes.com/sites/danielmarlin/2018/01/16/ millennials -this-is-how-artificial-intelligence-will-impact-your-job-for-betterand-worse/#164ba5e44533 (Accessed on15th January 2020).

Marwala T. (2018), Tackling bias in technology requires a new form of activism. https://www.uj.ac.za /newandevents/Pages/Opinion-Tackling-bias-intechnology-requires-a-new-form-of-activism.aspx. (Accessed on 6th April 2020).

Mathevula, M. D. (2015). The effects of information and communication technology (ICT) on teaching and management of curriculum-related activities: A case of secondary schools in the Groot Letaba Circuit. Mopani District in the Limpopo Province. MEd Thesis.

McNully N. (2018), Are South African Schools ready for the 4IR? July 8, 2018. Niall McNulty Learning, Publishing and Tech Stuff. URL:https://www.niallmcnulty.com/2 018/07/are-south-african-schools-ready-for-the-4th-industrial-revolution. (Accessed on 15th January 2020).

Mihaescu D., & Andron D. (2019), "Education beyond the crisis: new skills, children's rights and teaching contexts", The International Study Association of Teachers and Teaching. 1st – 5th July 2019. Sibiu, Romania. ISBN: 978-606-12-1659-8, "Lucia Blaga" University Publishing House.

News Centre. (N.D), Are our schools preparing our learners for the Fourth Industrial Revolution? Eiffelcorp,www.eiffelcorp.co.za (Accessed on 17th July 2019).

Ngeze L.V. (2017), ICT Integration in Secondary Schools: Readiness and Way Forward. International Journal of Information and Education Technology, 7(6), 424-427.

OECD. (2015), Students, Computers and Learning: Making the Connection, PISA, OECD Publishing, http://dx.doi.org/10.1787/9789264239555-en. (Accessed on 29th November 2018).

Padayachee K. (2017), A Snapshot Survey of ICT Integration in South African Schools. South African Computer Journal 29(2), 36-65, https://doi.org10.18489/sacj.v29i2. 463 (Accessed 15th May 2017).

Siemens G. (2005), Connectivism: A Learning Theory for the Digital Age. elearnspace everything learning, URL: http://www.connectivism.ca/. (Accessed May 16, 2016).

Reid L. (2019), Learning Management Systems: The Game Changer for Traditional Teaching and Learning at Adult and Higher Education Institutions, Global Journal of Human-Social Science: (G) Linguistics & Education, 19(6). URL:https://www.researchgate.net/publication/334895309pages. (Accessed on 6th April 2020).

Retief J. (2019), Why Coding alone won't prepare our children for the 4IR, Education news South Africa. URL: https://www.bizcommunity.Com/Article/196/371/191819.html. (Accessed on 6th April 2020).

Sarayreh, B. H., Khudair, H., & Barakat, E. (2013). Comparative study: The Kurt Lewin of change management. International Journal of Computer and Information Technology, 2 (4), 626-629.

techUK. (2018), The Fourth Industrial Revolution, techUK submission to the Education Select Committee, June 2018. (Accessed on 16th July 2019)

Vandeyar, T. (2015, January). Policy intermediaries and the reform of e-Education in South Africa. British Journal of Educational Technology, 46, 344–359. URL: https://doi.org/10.1111/bjet.12130. (Accessed on 16th July 2019)

Zupanec V., Miljanovic, T., & Pribicevic, T. (2013), Effectiveness of Computer-Assisted Learning in Biology Teaching in Primary Schools in Serbia. Journal of the Institute for Educational Research 45(2), 422-444. DOI: 10.2298/ZIPI1302422Z.