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Information Literacy and Metacognitive Abilities of Teachers: Case of a South African Rural School

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ABSTRACT

The objective of this qualitative study was to assess the information literacy and metacognitive abilities of teachers in a rural school in South Africa. Data were collected through semi-structured interviews. Due to COVID-19 safety considerations, primary data was acquired from 10 teachers via semi-structured telephonic interviews. All participants' views were transcribed and analysed using thematic analysis to determine the similarities and differences in terms of their responses. The findings of the study amongst others revealed that despite the giant strides made by the South African government to digitize teaching and learning activities in schools, large proportion of rural teachers have phobia to use computer applications unassisted. Also, low self-evaluation, goal-setting and help-seeking/self-reflection were found to be metacognitive abilities which hamper their effective teaching skills via usability of ICT. The study concludes by recommending programmes such as cognitive development, emotional intelligence, computer-digital programming for all teachers in rural schools for optimal performance.

Key words: Information Literacy, Meta-Cognitive Abilities, Rural School,Under-Resourced, ICT

INTRODUCTION

The global trend of the Fourth Industrial Revolution (4IR), and the significance of Information and Communication Technology (ICT) in teaching and learning cannot be overstated. Both phenomena stimulate economic growth and boosts productivity among other things. Education's primary goal is to educate students and prepare them for future endeavours by utilizing accessible technology. For instance, following the findings of the work of Oke and Fernandes (2020), the Fourth Industrial Revolution (4IR) has the potential of enabling the learning experiences of students as well as transforming the workplace environment. Students in this study is used interchangeably with learners. The need to evaluate the environment provided for learning, in order to 'understand the facilitators and barriers to 4IR diffusion' is crucial (Oke & Fernandes, 2020). According to Oke and Fernandes (2020), there are prospects for the education sector to harness the inventions and novelties accompanied by the Fourth Industrial Revolution (4IR). This can be achieved through research as well as teaching to improve the learning experiences of students (Oke & Fernandes, 2020). It is however added that maximising the opportunities attached to the Fourth Industrial Revolution (4IR), could call for a major improvement in the curricula of the education system (Oke & Fernandes, 2020).

According to the 2017 report of the World Economic Forum (WEF) (2017 as cited in Ndung'u & Signé, 2020),

> Already, Africa's working population is becoming better educated and prepared to seize the opportunities provided by the 4IR: For example, the share of workers with at least a secondary education is set to increase from 36 percent in 2010 to 52 percent in 2030. (p. 63).

The foregoing implies that there are benefits to be enjoyed by African nations in different sectors including education following the Fourth Industrial Revolution (4IR). In the meantime, the workforce of African nations is beginning to position themselves to maximise the opportunities envisaged to be provided by the Fourth Industrial Revolution (4IR). Additionally, ICTs enable educational institutions and other organizations to harness and use technology to supplement and support the teaching and learning processes (Gebremeskel, 2016). Despite the widespread support for ICT-assisted teaching and learning, as well as investment in ICT, and donation of ICT equipment to iLembe District, secondary schools still confront a challenge of transforming learners' learning processes. To provide with the necessary skills, they need to perform effectively in a dynamic, information-rich, and ever-changing society.

Importantly, the United Nations and the World Bank have affirmed that information and communication technologies (ICTs) can improve learners' and instructors' access to educational networks. It can expand the availability of high-quality educational materials in rising global economies. However, the emergence of the COVID-19 pandemic

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has made face-to-face classroom teaching impossible, thus online teaching and learning has been rapidly embraced by educational institutions globally. This further ascertains the significance of ICT in teaching and learning in high schools, especially in developing countries including South Africa. Moreover, extant literature (Dlamini & Mbatha, 2018; Durodolu & Ocholla, 2016; Kafu-Quvane, 2021) has been conducted diverse studies on the factors affecting the use of ICT generally in schools and challenges of ICT infrastructure in different African schools. Notably, Campbell (2005) opines that the 21st century' teachers require some self-defence apparatus to cope in this information age, which in this study was conceptualised as metacognitive abilities.

Conceptually, metacognitive was defined by Flavell (1976) as individuals' awareness of their own cognitive processes or knowledge of any subject. It involves individual abilities such as self-assessment, self-regulation, self-determination, intrinsic and extrinsic motivation, monitoring and planning use effectively to solve problem (Mevarech & Kramarski, 2003; Veenman, 2006). Apparently, teachers, students and parents are major education stakeholders who are dominantly significant in accomplishing educational goal. Thus, learners, academic outcome also depends largely on the quality of information disseminate through appropriate and available school space. Therefore, it is expected that for teachers to be capable of equipping learners with the knowledge, skills, and values who can face the global challenges and transform society for a sustainable future (Mngomezulu et al., 2021), the must also posse metacognitive abilities that is capable to manoeuvre classroom media resources (Othman and Leng, 2011).

In the same vain, information literacy was perceived by Williams-Mitchell (2014) as the potential to recognise indispensable information, become aware of how such information is structured, identify the appropriate sources of the information, appraise the sources decisively, possess the skills to ultimately disseminate the information to the target audience. Regrettably, most teachers in iLembe District in KwaZulu-Natal Province are deficient is these abilities (Terry, 2014). This indicates that the learning outcomes of students in secondary schools in iLembe area may be poor due to literacy skills gap in ICT among teachers. Secondary school is an educational level suitable to gain the skills and competences needed to be effectively equipped, and to adapt to socioeconomic changes in society. When such skills are deficient in learning outcomes, it may create a gap. Therefore, this study scrutinises information literacy and metacognitive ability of teachers in Ilembe District, Kwazulu-Natal, South Africa.

LITERATURE REVIEW

Information Literacy and Metacognitive Abilities of Teachers

Information literacy is unquestionably important in the classroom, especially with the introduction of resource-based teaching and learning in many South African high schools (Durodolu, 2018). Nonetheless, the lack of competent teachers with mental abilities to evaluate and disseminate information using ICT medium in classroom setting has continued to hamper the achievement of educational goal. Although there is paucity of literature on the link between information literary and metacognitive abilities of teachers, similar studies have established the importance of teachers' metacognitive abilities on the use of ICT for effective teaching and learning process (Durodolu, 2018; Othman & Leng, 2011; Williams-Mitchell, 2014). For instance, Durodolu (2018) noted that self-concept and self-esteem as metacognition of teachers is linked with the transmission of information and understanding to the next generation.

The study of Ojo and Adu (2018) discovered that teachers' perception and practices highly predicted learners-centered approach in a mixed-methods design study on teachers' incorporation of ICT in technologically advanced schools. Teachers' attitudes toward technology, on the other hand, have a significant impact on how teachers and students use technology and how they use various educational approaches. Graham, Stols, and Kapp (2020) looked at how computer self-efficacy, constructivist teaching perspectives, computer attitudes, gender, and teaching self-efficacy affected predicted ICT use among Chinese instructors. Mbebe's (2017), and Simon and Ngololo's (2018) studies affirmed that teachers' attitudes toward ICT predicted school future use of ICT. Another study by Hollis (2011) established that one major serious challenge of the information age is information proliferation. Also, Andreassen and Bråten (2013) in their empirical study declared that teachers' abilities to a large extent determine the trustworthiness of sources of information that can is capable of equipping learners for future challenges and society transformation. Based on the foregoing, it can be inferred that metacognitive potential of teachers in proper and adequate transmission of knowledge via the instrumentation of ICT is gamine and require urgent attention. Hence, the justification for this study.

Theoretical Explanation

Diffusion of Innovation Theory (DOI)

Diffusion of Innovation Theory was propounded and established by Everest Rogers in 1962 as a general diffusion model. Before 1940s and 1950s, various studies in different disciplines have been conducted to understand how innovation diffuse. However, Rogers's (1962) DOI describes clearly how an idea or an innovation is accepted and adopted among a group of people. Rogers used the word technology and innovation interchangeably because most of the diffusion studies often involve technological innovations. Conversely, Ajani (2021) and Gikenye (2012) noted that an innovation idea could be in form of a technological technique, or an idea communicated to a group of people in a social system. The theory explains how an idea or a newly developed product or an idea attains momentum and spread among a population. The end point of this diffusion is that the person adopts a new idea or the product and a new behaviour. Meanwhile, when a user performs an activity or does things differently from a previous behaviour, it is referred to as adoption

(Rogers, 2003). It is important to note that a person must perceive idea or product as an innovation and thus make the diffusion. This implies that the adoption and use of ICT in teaching and learning in schools will lead to a change in behaviour of the users (teachers) and will definitely impact the learners. Rogers (2003) identified important characteristics (the tenets) of DOI that can lead to its adoption, and how diffusion can be influenced. These characteristics are Relative Advantage, Compatibility, Observability, and Complexity. According to Rogers, fast adoption of an innovation greatly depends on the benefits it possesses and the ease of adoption. In addition to the aforementioned five characteristics of innovation, Rogers (1995) and Surry (1997) highlighted four important factors that can also influence diffusion of innovation. These factors include the innovation itself, how detailed information regarding the innovation is communicated, time, and the nature of the social system where the innovation is being introduced. These factors can influence the use of ICT among teachers and can invariable have effects on the teaching and learning of the subject in schools. Thus, the reason for this study is to appraise the information literacy skills and metacognitive ability of teachers using Ilembe District, KwaZulu-Natal Province of South Africa as case study.

Problem Statement

In this modern age with global trend of the Fourth Industrial Revolution, the significance of ICT in teaching and learning cannot be overstated. The primary goal of education is to prepare learners for the future including workplace by utilizing accessible technology. ICTs enable educational institutions and other organizations to harness and use technology to supplement and support the teaching and learning processes (Gebremeskel, 2016). Despite the widespread support for ICT-assisted teaching and learning, as well as investment in ICT and donations of ICT equipment to iLembe District, some teachers are still incompetent to use ICT resources for teaching and learning in classroom settings (Durodolu, 2018; Terry, 2014). To provide students with the necessary skills, they need to perform effectively in a dynamic, information-rich, and ever-changing society, teachers are liable. Noticeably, no study has been conducted specifically on information literacy and metacognitive ability of teachers in iLembe District.

The main concern of this study was to investigate information literacy and metacognitive abilities of secondary school teachers in iLembe District, KwaZulu-Natal Province of South Africa. Precisely, the study seeks to proffer answers to the following research questions:

1. Do teachers in secondary schools at iLembe District have information literacy abilities to use ICT in classroom?
2. What are the major metacognitive challenges faced by teachers in secondary schools at iLembe District in the use of computer applications to classroom setting?

METHODOLOGY

This study adopted a qualitative research design and situated within the interpretative paradigm (McMillan & Schumacher, 2010). The appropriateness of this design lines in it assumption, which permits the use of a small sample size as a case study to represent a given population. In this current study, the population consisted of teachers iLembe District. Five secondary schools were multipage randomly selected through step-by-step approach was employed to determine participate for the study. In the first stage, five schools were randomly selected through a ballot approach of Yes or No. At stage two, permission of the school principle was sought to carry out the study. Those who picked yes, having explained the aim and objectives of the study to them after sought the permission of the school principle were recruited for the study while at stage three, which was the final stage, two teacher representatives who volunteer were recruited for the study. Thus, in this study, a total of ten teachers formed the sample. To source needed information for the study, an unstructured in-depth-interview was scheduled. In order to eliminate language barriers and allow free expression, the questions were worded in English and IsiZulu. The responses were later transcribed verbatim and analysed using thematic content analysis so as to achieve the objective of the study and answer the research questions.

FINDINGS AND DISCUSSION

The findings of the study are presented in this section as derived from the two research questions raised, along with the discussions of each result based on the responses of the ten teachers who participated in the study.

Research Question One

The first question this study sought to answer was "do teachers in secondary schools at iLembe District have information literacy abilities to use ICT in classroom?"

The views of the participants regarding the information literacy abilities to use ICT skills in classroom. Some of these participants mentioned that as much as they wanted to use ICT-related equipment, they lacked the appropriate skills to do so. While some who possessed the skills could not use the skills to teach because their school lacked the ICT resources. Participant 9 in school 4 responded that:

> *As a teacher, I do have skills. I have been trained to use ICT. I know how to use a smart board, presentation for teaching and learning, zoom for a meeting, and use social media for teaching and learning. Also, I have equipped some of my colleagues and some of my learners so that we can all use ICT. So, those who are willing are empowered. So, I will say I possess adequate skills I can use in teaching*.

Participant 3 in school 2 also shared similar views.

> *Yes, I have those skills. I have the skills of browsing the internet to access information for my learners. I can use any application that is useful for teaching and learning my subject. I can use many programs in ICT. I can use any design available in my school. I can install or uninstall any software application on any device. I can use MS Word, PowerPoint, Excel and even CorelDraw*.

Subsequently, participant 7 (school 1) affirmed that he possessed the necessary skills.

I do have ICT skills such as internet navigating skills, surfing skills networking skills, database management. I can count a lot that I can use for teaching.

However, participant eight in school three viewed that he needed ICT training which would be used to teach learners.

ICT workshop or training is needed so that we can get computer knowledge.

Additionally, participant seven; school 1 also supported the need for ICT training for teachers by stating that:

I do have ICT skills but I still need a workshop of how to effectively use the Internet and academic electronic databases. *I can create slides for learners. It makes learning easier as you display it to learners while teaching. And learners who are not in class can also benefit*.

Some of the participants affirmed that they possessed the necessary information literacy abilities to use ICT for teaching and learning purposes. However, some of these participants indicated the need to train teachers on the effective use of the internet and academic electronic databases for adequate online resource as supplementary materials in teaching and learning engagement. This outcome is in tandem with the position of Durodolu et al. (2013) and Durodolu (2018) who asserted that Lagos State's teachers have positive view about the need for information literacy abilities. Also, this finding laid credence on the study of Ajani (2020) who affirmed that the entry knowledge and skills of pre-service teachers into the teaching profession cannot sustain them in modern teaching and learning that involve the integration of various learning technologies. The theory of DOI also posits that users of innovation such as integration of ICT into teaching and learning need to have a good mastery of the appropriate skills. This concurs with Messina and Tabone's (2015) view that regular update of knowledge and skills of ICT is necessary to effectively integrate ICT into classroom practices. Meyer et al. (2017) aver that technical know-how of ICT is necessary for its adoption and use in teaching and learning. Similarly, Vadachalam and Chimbo (2017) concur that the effective use of ICT in teaching and learning is determined or influenced by the level of ICT skills possessed by the teachers. Ajani (2019) in accordance with Jita and Mokhele (2014) suggest that a well-structured training or workshop on the information source using academic database is necessary to support subject-contents delivery through the use of ICT for effective teaching.

Research Question Two

The second research question asks: "What are the major metacognitive challenges faced by teachers in secondary schools at iLembe District in the use of computer applications to classroom setting?" In seeking answer to the above question, responses from the participants indicate that large proportion of rural teachers have phobia to use computer applications unassisted, low self-evaluation, lack of goal-setting and negative attitude towards help-seeking a emerged as metacognitive challenges faced by rural teachers in the use of computer applications in classroom setting. In the words of the participants, Participant 2 from school 1 has this to say:

The major challenge is the fear/phobia of using computer applications to develop lesson plan. Because we often feel overwhelmed with daily classroom responsibilities and achieving the mandated curricular objectives.

Participant four in school five expressed that:

We are in the world of technology. Most of the things come via technology. Even the meeting or the information from the department come through technology. But the real challenge is that we have low self-evaluation of ourselves which makes if difficult to try and use computer applications. Also, everybody is overwhelmed by the day-to-day school activities, which normally leads to negative attitude of seeking help from one another when is necessary.

Participant six in school 1, explicated that lack of personal goal setting hampered the use of computer applications in classroom for teaching and learning purpose.

I think lack of personal goal-setting is a major issue. If one determines to do anything, time will be devoted and efforts to achieve it will be directed towards it. Some of us teachers lack personal goal. So, it does limit our computer efficacy.

Participants 10 in school five articulated that

Okay, some of us need technical supports from computer (gurus) experts. The school needs to have technological support from someone who is knowledgeable of the ICT, otherwise, there is confusion and frustration due to fear of using computer applications. Number two boils down to teachers' attitudes to seek help from other colleagues. Some of us teachers have negative attitude towards seeking assistance on how to be better at what we are employed to do. Teachers need to brace-up and seek help from those who know better.

Participant eight in school three also expressed that infrastructure is the problem of frequent self-reflection on what you think you know:

It is a big problem when you don't do self-evaluation or reflection of what you think you know. Some of us used to think we know how to use some computer applications but we have forgotten them since we don't use them frequently for information sourcing.

Based on the findings, all the teachers agreed and identified the major challenges that constitute hindrances to the use of computer applications in classroom settings. To sum it up, teachers who participated in this study are experiencing insufficient metacognitive abilities to teach effectively in this ICT dominated generation. This outcome is substantiated by some previous studies including Opeyemi et al. (2019), Kurt (2019), and Mishra and Koehler (2006). These study equally found that lack of metacognitive skills hampers teaching effectiveness. Similarly, Dlamini and Mbatha (2018) noted among other factors lack of personal development and low self-esteem are the major setback to explore learning resources in schools via computer applications. According

to Rogers' (2003) explanation on the Diffusion of Innovation theory, the use of technologies in teaching and learning is enhanced by the attitudes of the teachers to use the innovation as well as their computer knowledge, and skills of the appropriate gadgets for classroom teaching.

Moreover, other related studies have established that incorporation of metacognitive strategies into daily instruction is importance if learners will be adequately equipped to optimally function and face the global challenges (Flavell, 1979; Okoza et al., 2013; Smith, Black & Hooper, 2020; Zimmerman, 2000). Importantly, Winne and Nesbit (2010) asserted metacognition is a key variable in effective teaching and learning process, and teachers are major agent if educational objective of transforming society and sustainable development will be achieved (Mngomezulu et al., 2021). Durodolu (2018) noted that self-concept and self-esteem as metacognition of teachers is linked with the transmission of information and understanding to the next generation. To this end, the use of ICT in teaching and learning is vital in preparing and exposing learners to the global world of ICT (Simon & Ngololo, 2018). However, the second objective of this study sought to know some possible challenges of using computer application in classroom settings.

CONCLUSION AND RECOMMENDATION

The focus of this study has been on the assessment of information literacy and metacognitive abilities of teachers in Ilembe district of KwaZulu-Natal. The paper has demonstrated that despite the giant strides made by South African government to digitize teaching and learning activities in schools, some rural teachers possessed the necessary information literacy abilities to use ICT for teaching and learning purposes, while a few others indicated the need to train teachers on the effective use of the internet and academic electronic databases for adequate online resource as supplementary materials in teaching and learning engagement. Importantly, fear/phobia to use computer applications unassisted, low self-evaluation, goal-setting and help-seeking/self-reflection was found to be metacognitive abilities which pose challenges to teachers' effective use of computer application for teaching and learning. Based on the findings of this study, it is recommended that rural teachers should focus on personal development that will help them in effective profess of their chosen profession and the achievement of educational goal. Also, the Department of Basic Education should also play a leading role in developing cognitive development, emotional intelligence, and computer-application training programmes for all teachers in the rural schools for optimal performance. Future researchers should focus on quantitative research design that allows for large sample size and more participation so that the relationship between information literacy and metacognitive abilities of rural teachers can be generalized.

REFERENCES

Abubakar, A.M. (2016). *An assessment of the use of ICT in teaching and learning in public secondary schools in Northeastern Nigeria* [Master's Thesis]. Eastern Mediterranean University (EMU)-Doğuakdeniz Üniversitesi (DAÜ).

Ajani, O.A. (2019). Understanding teachers as adult learners in professional development activities for enhanced classroom practices. *AFFRIKA Journal of Politics, Economics and Society*, *9*(2), 195-208.

Ajani, O.A. (2020). Teachers' professional development in South African high schools: how well does it suit their professional needs? *African Journal of Development Studies (formerly AFFRIKA Journal of Politics, Economics and Society)*, *10*(3), 59-79.

Ajani, O.A. (2021). Using Moodle for Curriculum Delivery in Higher Institutions during the Covid-19 Pandemic. *International Journal of Innovation, Creativity and Change*, *15*(4), 708-724.

Aydin, M.K., & Gürol, M. (2019). A Systematic Review of Critical Factors Regarding ICT Use in Teaching and Learning. *International Journal of Progressive Education*, *15*(4), 108-129. https://doi.org/10.29329/ijpe.2019.203.9.

Creswell, J.W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Sage.

Dlamini, R., & Mbatha, K. (2018). The discourse on ICT teacher professional development needs: The case of a South African teachers' union. *International Journal of Education and Development using Information and Communication Technology (IJEDICT), 14*(2), 17-37

Durodolu, O. O., Adekanye, E. A., & Olorunfemi, D. Y. (2013). Information Literacy Skills of Arts Subject Teachers in Lagos State Senior Secondary Schools, Nigeria. *IOSR Journal of Humanities and Social Science (IOSR-JHSS), 14*(6).

Durodolu, O.O. (2018). Secondary School Teachers' Perceptions of Information Literacy Skills. *Mousaion: South African Journal of Information Studies*, *36*(1), 16-36. https://doi.org/10.25159/0027-2639/3873

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry. *American Psychologist, 34*, 906-911.

Gebremeskel, G.B. (2016). The paradigm role of ICT for behavioral and educational psychology: The case of developing countries. *International Journal of Information and Education Technology*, *6*(4), 301-307. 10.7763/IJIET.2016.V6.704

Gikenye, W. (2012). The diffusion of mobile phones for Business and Information Management in Kenya. *Journal of Gender, Information and Development in Africa (JGIDA)*, *1*(1), 43-56.

Graham, M.A., Stols, G., & Kapp, R. (2020). Teacher Practice and Integration of ICT: Why Are or Aren't South African Teachers Using ICTs in Their Classrooms. *International Journal of Instruction*, *13*(2), 749-766.

Jita, L.C., & Mokhele, M.L. (2014). When teacher clusters work: Selected experiences of South African teachers with the cluster approach to professional development. *South African Journal of Education*, *34*(2), 1-15. 10.15700/201412071132.

Kafu-Quvane, B.P. (2021). Chronicling teachers' experiences on integrating information and communication tech-

nology across the curriculum. *J Transdiscipl Res S Afr*. *17*(1), a783. https://doi.org/10.4102/td.v17i1.783

Kumar, R. (2019). *Research methodology: A step-by-step guide for beginners*. Sage.

Kurt, S. (2019). TPACK: Technological Pedagogical Content Knowledge Framework. *Educational Technology*. https://educationaltechnology.net/technological-pedagogical-content-knowledge-tpack-framework/.

Mbebe, T.M. (2017). Analysing the developmental role of ICT in the case of Bakgoma community library. Master's thesis. Department of Public Administration, University of Stellenbosch.

Messina, L., & Tabone, S. (2015, June). Training kindergarten and primary education student teachers to plan learning units combining TPACK, LAT and multimodality. In *1ST International Conference on Higher Education Advances (HEAD'15)* (pp. 349-356). Editorial Universitat Politècnica de València.

Meyer, I., Marais, M., Ford, M., & Dlamini, S. (2017, May). An exploration of the integration challenges inherent in the adoption of ICT in an education system. In *International Conference on Social Implications of Computers in Developing Countries* (pp. 463-474). Springer, Cham.

Mishra, P., & Koehler, M.J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers college record*, *108*(6), 1017-1054.

Mngomezulu, M. S., Lawrence, K. C., & Mabusela, M. S. (2021). Recruiting Competent Teachers in South Africa for a Sustainable Future: The Role of School Governing Bodies. *African Journal of Inter/Multidisciplinary Studies, 3*(1), 217-228.

Ndung'u, N., & Signé, L. (2020). The Fourth Industrial Revolution and digitization will transform Africa into a global powerhouse. *Foresight Africa*. https://www.brookings.edu/wp-content/uploads/2020/01/ForesightAfrica2020_Chapter5_20200110.pdf.

Ojo, O.A., & Adu, E.O. (2018). The effectiveness of Information and Communication Technologies (ICTs) in teaching and learning in high schools in Eastern Cape Province. *South African Journal of Education*, *38*(1).

Oke, A., & Fernandes, F.A.P. (2020). Innovations in Teaching and Learning: Exploring the Perceptions of the Education Sector on the 4th Industrial Revolution (4IR). *Journal of Open Innovation: Technology, Market, and Complexity, 6*(31), 1-22. doi:10.3390/joitmc6020031.

Okoza, J., Aluede, O., & Owens-Sogolo, O. (2013). Assessing students' metacognitive awareness of learning strategies among secondary school students in Edo State, Nigeria. *Research in Education, 90*, 82-97. doi:10.7227/RIE.90.1.6

Opeyemi, D. A., Ayodele, V., Alufa, O., Anderson, E., Strachan, R., & Emembolu, I. (2019, April). Barriers and identified solutions to the integration of digital technologies in the classroom: A case study of teachers in Nigeria. In *2019 IEEE Global Engineering Education Conference (EDUCON)* (pp. 953-958). IEEE.

Othman, N., & Leng, K. B. (2011). The Relationship between Self-Concept, Intrinsic Motivation, Self-Determination and Academic Achievement among Chinese Primary School Students. *International Journal of Psychological Studies, 3*(1), 90. Rogers, C. R. (1962). The interpersonal relationship: The core of guidance. *Harvard educational review*.

Rogers, E. M. (2003). A prospective and retrospective look at the diffusion model. *Journal of health communication*, *9*(S1), 13-19.

Simon, W.E., & Ngololo, E.N. (2018). Teachers use and integration of ICT in the teaching of Life Science. *The Namibia CPD Journal for Educators*, 51-64. https://doi.org/10.32642/ncpdje.vi.1278

Smith, A. K., Black, S., & Hooper, L. M. (2020). Metacognitive knowledge, skills, and awareness: A possible solution to enhancing academic achievement in African American adolescents. *Urban Education, 55*(4), 625-639.

Terry, H. (2014). ICTs and the accounting Profession in a SIDS. *Journal accounting and Finance Research*, *3*(3).

Vadachalam, N., & Chimbo, B. (2017). Using Information and Communication Technologies to teach and learn mathematics in South African schools: A snapshot view of its impact. *Africa Education Review*, *14*(1), 212-234.

Winne, P. H., & Nesbit, J. C. (2010). The psychology of academic achievement. *Annual Review of Psychology, 61*, 653-678.

World Economic Forum (2017). *The Global Human Capital Report 2017*. Geneva: World

Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts M. Zeidner & P. R. Pintrich (Eds.), *Handbook of self-regulation* (pp. 13-39). Academic Press.