Repurposing African teachers for sustainable development: Online global trends

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Abstract

This intellectual piece aims to repurpose African teachers for the achievement of Standard Development Goals (SDG) 2030 target through online global trends. To achieve this, a qualitative review method was adopted to gain insight to previous studies that have established the positive impact of Information and Communication Technology (ICT) skills and competencies in teaching and learning processes. The findings show that many African teachers need to be adequately equipped with ICT skills as captured in the UNESCO framework. The study, therefore, concludes that teachers are inevitably becoming reskilled and reequipped with a virtual learning-based framework so that the SDG 4 can be achieved. Hence, the virtual learning space model with potential to equip teachers with necessary and requisite skills and competencies was developed and recommended. This will enable teachers to transit into an online teaching environment, where the teaching and learning processes are sustained without being hampered by any future unprecedented circumstances.

Keywords: African teacher, COVID-19, ICT-CFT, online global trends, sustainable development.

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1. Introduction

The advent of the COVID-19 pandemic has clearly illustrated how the world is globally interconnected, interrelated and interdependent; thus, the notion of nation-specific problems is eliminated. Coronavirus, which the world initially believed to be a Chinese virus, has turned out to be the largest typical pneumonia and communicable disease outbreak in the whole world and it causes a daily increase in mortality rates across the globe. The impact of the COVID-19 pandemic has infiltrated the world's supposed secure systems. This has led to irrevocably worsened economic, educational and social pain imposed by social restrictions – especially compulsory quarantine which is meant to contain the spread of COVID-19. The restrictions have not only affected infected persons, but have also taken a toll on family members, children, all society and the pursuit of an educational sustainable development target (Lawrence & Fakuade 2021). Thus, Kapenieks (2020) stressed that the ongoing deformation in society is currently the main cause of an unsustainable lifestyle. In support of this submission, it is worth noting that the pandemic may have further threatened the achievement of the Standard Development Goals (SDG) 2030 agenda – especially Goal 4, which positions teachers as the major actors who need to be re-orientated towards sustainability (Mngomezulu, Lawrence & Mabusela, 2021; Nketsia et al., 2020; Salite et al., 2020). Until now, and despite all the preventive measures put in place by the different nations of the world, no nation can say it is free from the virus. Everywhere, learners/students cannot go to school due to the shutdown of schools at all levels. Therefore, this situation has caused the teaching and learning processes to be put on hold. This reality has forced all systems to be rethought and aligned to accommodate the new normal (Lawrence & Fakuade 2021). Thus, due to the negative effects of the pandemic, health, economic, political, religious and, most importantly, educational sustainability is under pressure and threatened.

Evidence abounds on the undesirable impacts of COVID-19. This has generated concerns among citizens across nations, with approximately 575 million students in 188 countries affected by the closure of schools due to a geometric spread of the virus (Duraku & Hoxha, 2020; UNESCO, 2020). Learners in examination classes such as grade 9 and grade 12, particularly those who are supposed to write matric, cannot sit for their examinations until the authorities determine otherwise. The academic calendars of final-year university students have also been disrupted. Other concerns that have ensued due to the preventive measures of social isolation occasioned by the spread of the pandemic are the unpreparedness of parents and children for the new online/remote learning approach, the limited access to the needed technology, the Internet or the insufficiency of technological formats used for the economically disadvantaged individuals and children with special educational needs (UNESCO, 2020). Salote et al. (2020) emphasise anthropocentrism as being instrumental to both unsustainability and sustainability, i.e., the adjustment to current change in society is factored by the relationship between humans and nature. While the current pandemic is an interaction between humans and nature, Salote et al. (2020) assumed that COVID-19 is sufficient for the adoption and the implementation of a technological learning-based approach, vis-à-vis education through natural occurrences geared towards attainment of sustainability.

However, teachers' capacity for conducting online/remote teaching and learning has created great concerns owing to the levels of their access, knowledge and skills in the use of technology and the level of their home-based isolation. These concerns are peculiar to African countries, and get worse in countries where there is poor electricity supply, bad mobile network coverage, an extremely low level of use or familiarity with the digital classroom, as well as the associated economic deprivations ravaging the African educational systems. Therefore, to salvage equitable access to quality and lifelong educational opportunities for all by 2030, educational institutions around the globe are harnessing or leveraging technological innovations to create or curate contents for remote teaching and learning processes. Institutions with technology already in place need only to activate the process. However, most teachers in African schools have insufficient knowledge and skills to advance and implement appropriate models

to initiate online teaching and learning processes (Duraku & Hoxha, 2020). To overcome these obstacles, most schools are left with the option of just keeping their students or learners engaged while at home with the available and affordable technological solutions. However, studies have shown that pre-pandemic the level of preparedness of educational institutions in Africa to adopt technological solutions as most effective and efficient alternatives compared to face-to-face teaching and learning is significantly low (Ogundolire, 2020). It is, therefore, important for African teachers be repositioned for the full adoption of practices that can prepare students/learners if the achievement of education for sustainable development is to become possible. Nketsia et al. (2020) described education for sustainable development as individual human potential, knowledge, skills and values acquired by children, youth or adults to create and enjoy sustainable futures (Hopkins et al., 2020). It is generally easy to acquire any psychomotor skills, but it takes a personal concerted, deliberate and well-planned effort to sustain the acquired Information and Communication Technology (ICT) skills, when peradventure all necessary apparatus is implemented.

1.1. Concerns of the present study for educational sustainability

Unprecedented events will keep affecting our world and all sectors of the economy will be adversely impacted whenever they occur. One example of such extraordinary events is the COVID-19 pandemic, which has now impacted all sectors negatively. The negative effects of the pandemic on the sectors further indicate the level of unpreparedness of world stakeholders. The educational sector is among the most affected by the pandemic. It has completely shut down the teaching and learning processes and forced teachers and students to stay at home. This further proves that the existing processes, skills, competencies and systems – the architectures of educational stakeholders – are defective. It is crucial to forestall further damage to global commitment towards a sustainable future for the good of all, as well as the achievement of SDG 2030 target from similar occurrences, revitalisation of education for sustainable development by repurposing African teachers towards teaching sustainability. The need for teachers to be equipped to handle future uncertainties through online learning spaces is inevitable.

With the advent of the COVID-19 pandemic, nations with such systems, processes, architectures and competencies in place only need migrate into the space and the teaching and learning processes continues. However, African teachers/nations that do not have such systems, processes and competencies in place only harness haphazard alternatives, which can provide momentary palliatives, and this further threatens educational sustainability. Thus, it is apparent that African nations have not adequately prepared African teachers to handle such occurrences (Duraku & Hoxha, 2020; Ogundolire, 2020). Previous studies have established that teacher education is a key player in the achievement of the SDG 4 targets (Chankseliani & McCowan, 2021; Kapenieks, 2020; McCowan, 2019) Thus, the achievement of equitable, inclusive, quality education and lifelong learning opportunities for all ultimately depends on sustainable reskilling and retooling of teachers in Africa. As a result, this study proposes the need to repurpose African teachers' education for educational sustainability to forestall similar occurrences and suggests various technological affordances. It also recommends that African nations should deliberately invest in ICT competency of teachers as part of the commitment and effort to reduce the current unsustainability of education in Africa.

1.2. Theoretical framework for personal sustainability

To position this paper accurately, a theoretical framework that guarantees sustainability of continuous reskilling of teachers through acquisition of ICT competencies will be examined. Therefore, this study adopts competency theory, otherwise called transposition of competency and learning. Azemikhah (2005) proposed the theory at the 13th annual international conference on post-compulsory education in Australia. The theory basically focuses on the development of a new way of teaching and thinking in an

innovative education era. The theory believes that there are certain values, knowledge and skills that are inherent in individual professionals in terms of practical orientation. Being a constructivist-based theory, it involves cognitive, personal, functional, ethical and mental abilities. The theory further lays emphasis on the three elements of competency development: the minds, the physical events and the equilibrium. The choice of this theory lies on the principle of anthropocentrism and personal sustainable development using these three elements as instruments to achieve teaching and learning sustainability (Salote et al., 2020). The mind illustrates the mental ability of an individual to acquire and process new skills abstractly. The physical events are ICT kinetic activities involved in the newly acquired skills, while the equilibrium ensures that ICT skills acquired are learner-oriented, so that leaners' knowledge is improved. Fundamentally, competency development theory argues that teachers' skills development should be learner-centred and involve mental reflection as well as physical activity processes (Azemikhah, 2005). This is similar to the assertion of Stevenson (2000) that learners' interest is based on the individual's prior experience and knowledge, which paves the way for a holistic understanding of humans and their relationship with the natural environment. This way, sustainable education through transdisciplinary understanding of the world is made possible with teachers' reorientation (Kapenieks, 2020). In this COVID-19 era and in any unprecedented occurrence, it is apparent that the teaching profession would become complex and there would be a need to develop learning materials and delivery approaches that would expose leaners to critical ideas and concepts in their different fields of study of the pedagogy which is also geared towards sustainability. Thus, how teachers communicate knowledge and ensure leaners' comprehension during this era of social distancing due to the pandemic is the main idea of the competency theory (Jansen & van der Merwe, 2015).

1.3. Online global trends for teachers' professional sustainable development

Globally, for some decades now, schools and school systems, teachers and students have been using ICT for teaching and learning to increase learners' participation and to support the language acquired in early childhood. During this period, governments and educationists have made several efforts to advance teaching proficiencies of teachers via ICT tools and to improve education policies (White, 2008). In this regard, it has become clearer how much can be achieved and how fast knowledge can be disseminated within a few minutes using e-education platforms, including chat rooms, Moodle, online discussion boards and videoconferencing such as Zoom and Google Meet (Palvia et al., 2018). Recently, there have been emerging trends in e-classroom innovations across the globe; for example, digital responsibility, student-led learning, collaborative classrooms, connecting guardians and schools, computational thinking, life skills and workforce preparation, innovating pedagogy and emerging technologies (Google & Canvas8, 2019). Unfortunately, not many African countries have developed their teachers to function effectively using these e-classroom platforms. It is not adequate to function effectively only using the e-classroom platform, but the question of sustainability arises. Therefore, African teachers need to have a policy that supports personal sustainable plan towards the continuous acquisition of relevant and related skills.

Previous studies have established that the ICT capacity in Africa has not achieved much in advancing e-learning or classroom (Joshua et al., 2015; Mulhanga & Lima, 2018; Palvia et al., 2018). Although South Africa, Ghana and Kenya are the few countries in Africa with a progressive digital infrastructure and a clear e-education policy (Kotouaa et al., 2015; Vandeyar, 2015), African governments generally give less attention to teachers' development for ICT delivery. To deliver pedagogical contents to their students, UNESCO developed a framework on the need for teachers to acquire requisite ICT competencies. Consequently, teachers would be able to facilitate students' collaboration, problem-solving and learners' creative abilities using ICT to become life skilled and to be workforce prepared. This framework addresses all aspects of a teacher's role because modern societies are increasingly based on information and knowledge. They need to build workforces which have ICT skills to handle information and are reflective,

creative and adept at problem-solving in order to generate knowledge and enable citizens to be knowledgeable and resourceful so that they are able to manage their own lives effectively and lead full and satisfying lives. This will further encourage all citizens to participate fully in society and influence the decisions which affect their lives (UNESCO, 2011). Ensuring the achievement of these goals in teachers, UNESCO – in partnership with the industry leaders and global subject experts – has created an international benchmark which specifies the requisite competencies needed by teachers to teach effectively with ICT. It also presents effective and efficient approaches to acquire ICT competencies in a progressive manner that fosters sustainability.

The framework is arranged in three different approaches to teaching (three successive stages of a teacher's development) (UNESCO, 2011). The first is technology literacy – aiding students to use ICT to learn more efficiently; the second is knowledge deepening (KD) – enabling students to acquire in-depth knowledge of their school subjects and apply it to complex, real-world problems; the third is knowledge creation (KC) – supporting students, citizens and the workforce to create new knowledge required for more harmonious, fulfilling and prosperous societies. Therefore, the framework addresses all aspects of a teacher's work by relating the three approaches to teaching and learning which are based on human capital development ideology. The three approaches are cross-linked to six typical duties of teachers (UNESCO, 2011) The UNESCO framework itself will not translate into ICT competencies in teachers. However, it can be used to guide the acquisition of ICT standards by teachers. Before this can happen, conducting a needs assessment is paramount. Therefore, in this research, the framework was used as the basis for needs assessments.

	TECHNOLOGY LITERACY	KNOWLEDGE DEEPENING	KNOWLEDGE CREATION
UNDERSTANDING ICT IN EDUCATION	Policy awareness	Policy understanding	Policy innovation
CURRICULUM AND ASSESSMENT	Basic knowledge	Knowledge application	Knowledge society skills
PEDAGOGY	Integrate technology	Complex problem solving	Self management
ICT	Basic tools	Complex tools	Pervasive tools
ORGANIZATION AND ADMINISTRATION	Standard classroom	Collaborative groups	Learning organizations
TEACHER PROFESSIONAL LEARNING	Digital literacy	Manage and guide	Teacher as model learner

Figure 1. UNESCO Information and Communication Technology and Competency for Teachers (ICT-CFT) (2011)

Based on the framework in Figure 1, for teachers to accomplish the six duties as shown in UNESCO ICT-CFT (2011), they must progressively be taken through the three stages of ICT competency. The stages involved are technology literacy, KD and KC.

The technology literacy level involves the development of teachers' competences in relation to technology literacy which is based on fundamental digital literacies. It also involves the ability to select and use appropriate off-the-shelf educational-related software, such as games, drill-and-practice questions and WebQuest contents stored in computer laboratories or computer classrooms. These are used for complementing curriculum objectives, assessment, unit plans and lesson notes. Teachers must also

manage classroom data and support professional and technical learning with ICTs (UNESCO, 2011). For example, an engineering teacher is expected to make effective use of an Interactive White Board (IWB) together with PowerPoint to teach concepts such as gearing systems or any other topics. Prior to this development, teachers used projectors for classroom presentation – this has been the usual ICT-related activity.

The main objective of the KD level is to enhance the KD approach. This involves increasing the ability of students, citizens and the workforce to add value to society and to the economy by applying the knowledge gained in school subjects to solve complex, high priority problems encountered in real-world situations of work, society and in life generally. With this methodology, educators must comprehend strategy objectives and social needs and have the option to distinguish, plan and utilise explicit classroom exercises that address these objectives and needs.

This methodology regularly requires changes in the educational programme – changes that underline the profundity of comprehension over the inclusion of substance and evaluations that underscore the use of comprehension to certifiable issues. The evaluation centres on complex critical thinking and fuses appraisals into learning exercises (UNESCO, 2011). An engineering drawing instructor is baffled that a considerable number of his understudies are not inspired by technical illustration and do not comprehend its significance. He considers how he can utilise ICT to change their frame of mind and help learners become intrigued. Thus, he composes a point-by-point monetary offer to the institution, clarifying in detail how ICT will improve engineering drawing exercises and help learners to learn.

Finally, the objective of the KC phase is to build profitability by making learners, residents and a workforce that is persistently occupied with and profits by creativity, development and deep-rooted learning. In this phase, teachers should not have the option to structure learning exercises that advance these objectives (UNESCO, 2011). Rather, a psychology teacher, together with the philosophy and sociology teachers, decide on the ICT-based venture for learners.

1.4. Teachers' ICT competencies

It is general knowledge that no nation can develop beyond the quality of its education system, and this depends on the quality of teachers. The most needed skills and competencies that guarantee quality teachers are active skills and competencies in the use of technologies. Quality teachers seek continuous answers to questions to enable them to help students learn. They learn about appropriate technology, curriculum, pedagogy, assessment, evaluation and measurement. An ICT-competent teacher will be able to plan and perform professionally related activities. However, over the last years, the use of ICT in teaching has been undergoing constant changes in its approach from being an introduction to the system to an organisational infusion, as presented in Table 1. The approach explains that ICT is part of the teacher's pedagogical performance (Hogenbirk, 2006). The ICT competence matrix for teachers in Table 1 emphasises that teachers' duties are not only to interact with themselves, but much more with all other elements in teaching and learning processes. These elements are teachers' duties interacting with themselves, students, colleagues and the environment. The implications of the interaction are that teachers' ICT competence in relation to their duties should be effective towards all other elements within the teaching and learning processes.

Table 1: ICT competence matrix for teachers (Hogenbirk, 2006)

Themes	Pedagogics	Curriculum	Professional development	Organisation	Policy	Ethical aspects	Innovation	Technical aspects
Interaction with								

Himself
Students
Colleagues
Environment

Furthermore, UNESCO (2015) emphasises to teachers the importance of ICT competencies and identifies a set of ICT skills that 21st-century teachers should possess. Teachers are expected to have these skills to cope with the rigour of 21st-century classroom activities and meet the needs of learners. As clearly itemised by UNESCO (2015), a 21st-century teacher should be able to:

1. Operate computers and use basic software; for example, word processing, spreadsheets and email (all productivity tools should be learnt).

2. Evaluate and use computers and related ICT tools for instruction (evaluation of educational media).

3. Apply current instructional principles, research and appropriate assessment practices to the use of ICTs (pedagogy with technology PTK: Pedagogical and Technological knowledge

4. Evaluate educational software.

5. Create effective computer-based presentations (authoring e-learning packages).

6. Search the Internet for resources (Internet searching techniques).

7. Integrate ICT tools into student activities across the curriculum (Technological, Pedagogical, and Content knowledge -TPACK).

8. Create multimedia content to support instruction.

9. Create hypertext documents to support instruction.

10. Demonstrate knowledge of ethics and equity issues related to technology to keep up to date as far as educational technology is concerned.

Hogenbirk (2006) and Eck et al. (2002) made attempts to explain the required ICT competencies of teachers. Still their descriptions never showed the ICT domain of knowledge and how ICT skills could be applied to various duties of teachers in teaching and learning processes. Filling this gap, UNESCO 2011 published a document called ICT-CFT.

1.5. Proposed needed ICT skills in the COVID-19 era and Beyond for African teachers

The COVID-19 pandemic has taken its toll on the world scene. All nations are craving reforms and innovations that can trigger much discussion about the structure of teacher education and training programmes. Prior to the COVID-19 pandemic, the world had been clamouring for active reforms and paradigm shifts to better position teacher education and preparation (Akyeampong, 2003). As noted earlier, to repurpose teacher education in Africa, stronger models of teachers' preparation in the 21st century need to be built to face uncertainties for adequate, progressive and sustainable knowledge required to scale through any unprecedented events in the teaching and learning spaces. All intricacies are pointing to online or virtual learning spaces.

The teaching and learning processes do not need to be hampered by unprecedented events if nations have integrated structures, requisite skills and competencies into the teacher education programme and preparation. In the wake of the COVID-19 pandemic, pre- and in-service teachers were thrown off balance by the need to keep home-based learners busy and engaged. Most teachers were not adequately aware of steps and decisions they could adopt to engage students/learners; this is probably because teachers

had been trained to find solutions to any problem related to teaching and learning. Online or virtual learning requires three fundamental elements and teachers' preparation, and education must incorporate all the three elements to guarantee not being caught unaware in future occurrences:

- Digital content curriculum
- Virtual pedagogical enhancement programme
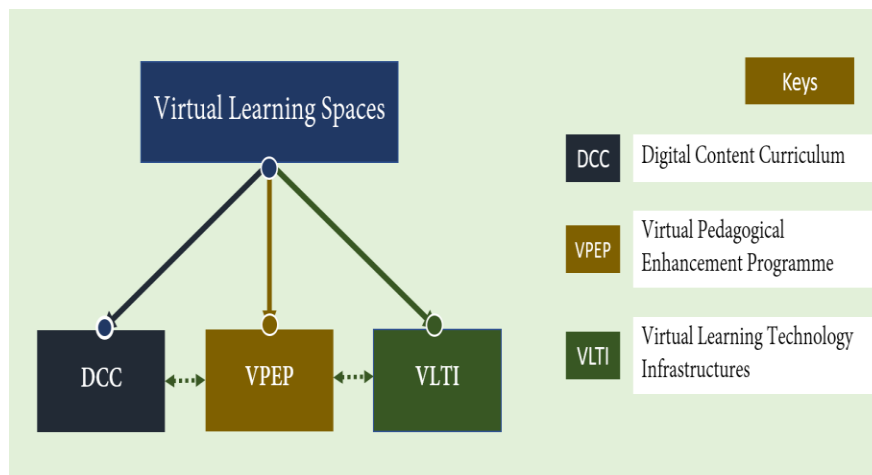- Virtual learning technology infrastructure

Figure 2. Virtual learning spaces model

Figure 2 clearly shows how moving from brick to click-online/virtual space in the teaching and learning processes globally can be achieved – especially in African higher Institutions. It is now the new normal. Reverting to the brick process in the teaching and learning processes is now considered abnormal. Any sector that is not moving into the new normal quickly will be brushed aside, which means the relevant has now become irrelevant. Any higher institution not championing the course of the new normal is therefore not relevant. What is the new normal in the teaching and learning processes? It is moving the teaching and learning processes completely into virtual or online learning environments, and to achieve this, the proposed model must be followed. The model of virtual learning space used to prepare teachers to acquire the requisite skills and competencies needed to cope with any unprecedented circumstances will now be discussed.

1.6. Digital content curriculum

The major hurdle that the teaching and learning processes need to overcome in the wake of the COVID-19 pandemic and beyond is the disruption that is experienced in the face-to-face classroom setting where normally physical teaching–learning materials are the order of the day. Physical or handy learning materials are usually distributed between teachers and students. However, when the physical interaction has been disrupted, the teaching and learning processes are not left with the option of engaging students online or virtually for institutions with such systems in place. Transiting to a virtual environment learning space requires a well-designed digital curriculum that is adaptable and relevant to the regular increasing needs of society. The content in digital formats that are adequately designed with the principles of digital design theories is the initial step towards preparing teachers for uncertainties.

The percentage of our curriculum content in digital format is the first fundamental step to initiate the process. Curriculum content must be in form of digital formats like micro-videos, infographics, simulations, podcasts, 360 videos, games, gamification, interactive videos, interactive e-books, virtual reality, augmented reality and mixed reality, which are together referred to as 'Immersive Learning'. The digital format is contained in different media elements, namely text, graphics, audio, video, animation and interactive media. These elements integrate all other media elements. Teaching–learning materials must be in the form of any of the media elements.

Teachers across the board need to have digital skills or ICT skills on how to convert the printed text into digital text through various software applications such as Microsoft Word, PowerPoint, WordPad, Notepad, LibreOffice, Focus Writer, Softmaker, WriteMonkey and Google Docs. The collective name for all these software applications is the word processor. All these software applications are either for desktop or mobile-based use and are synchronous or asynchronous. Teachers need to be versatile in the use of word processing software applications to help them transit into an online or virtual platform. Teachers should be able to create word documents, edit a word document and format text. All virtual platforms are surrounded by digital texts.

The most recommended word processing text software applications are Microsoft Office Suite, which is in different versions, and Google Docs, which integrates Microsoft Office applications. Additionally, teachers need to acquaint themselves with text formats in which a digital text is formatted before being uploaded onto the virtual platform, for example, doc, docx, portable document format (PDF), RTF, plain text and XML. Because of its smaller size and responsiveness, the most common text format usually uploaded on the web is PDF. Text formats can also be converted to another format for compatibility application – text typography plays a critical role in the user experience journey. Teachers' ability to process, manipulate, convert, format and edit digital text in the referenced formats makes the transition journey to digital platforms easier.

The use of graphics in preparing teaching and learning material cannot be overemphasised. From the printed graphics periods to the time of computer graphics, graphic design has played a critical and essential role in presenting school subject matter and various concepts in a more visually appealing manner to learners. Graphic design uses visual compositions to solve problems and communicate ideas through typography, imagery, colour and form. Teachers' ability to create and present a visually appealing concept can help countless learners across global online platforms.

There are different areas in graphic design where teacher capacity development can assist in the delivery of subjects being taught. In her blog, Mila Jones Cann (2018) wrote about such areas as the universally acceptable graphic design types with crystal impact in every facet of national life. They include the following:

- Visual identity graphic design;

- Marketing and advertising graphic design;

- User interface graphic design;

- Publication graphic design;

- Packaging graphic design;

- Motion graphic design;

- Environmental graphic design;

- Art and illustration for graphic design.

The immense impact of graphic design in various forms and types resonates with every profession. Therefore, teachers should not be lagging in the process of creating captivating visuals. Creating visually appealing concepts requires a degree of proficiency in the use of graphic software applications. Software applications for graphic design are available to create 2D and 3D concepts. Teachers need capacity development in this area, which is in regular demand for creating sticky and memorable contents.

The application of audio/sound media, video, animations, simulations and interactive media could be regarded as multimedia. Teachers' ability to create podcasts and audiobooks should be incorporated into the profile of a 21st-century teacher. Hosting and uploading teaching and learning materials in podcast format should be encouraged. Voice recording, editing and noise removal on voice-over recorded clips should be an integral part of a teacher's skill set. Various audio file formats (Mp3, WAV) play a critical role in recording and using podcast materials. Capacity development in the use of a typical Audacity software application is highly recommended.

Additionally, video creation skills of teachers should include both non-linear/linear and interactive video clips. Teachers' capacity development in video creation, audio, animation, interactive media and simulations is needed more than ever before in this century. The most common video editing software application useful for the teaching and learning process is Camtasia Studio, which can be learned in a matter of days. Interactive video, micro-videos and animated video can be achieved with Camtasia Studio. Simulations and animations skills can be achieved with a little effort expended on the part of teachers if they are properly trained to create animations. Adobe Captivate, Articulate Storyline and Lectora Inspire are on the frontline of simulated training videos. When teachers are trained on how to create multimedia learning materials, transiting to the online environment will be seamless. The use of multimedia in the teaching and learning processes can provide more than one learning opportunity, meaning that multimedia is multi-modal – i.e., communicating to different human senses – and thus more effective learning takes place (Evans & Gibbons, 2007).

1.7. Virtual pedagogical enhancement programme

It is not enough to train teachers how to create digital content. The delivery of digital content is the second step in preparing and training 21st-century teachers, who would, in turn, teach learners who would be proffering solutions to future unprecedented problems in our society. The delivery methods, strategies and techniques of digital curriculum contents must be compatible with the formats, structures, architectures and algorithms of virtual environment/learning spaces. Examples are flip learning strategies, game-based learning, gamification, augmented reality, micro-learning strategy, immersive learning strategy, social-media-based learning and the community of practice. Virtual learning environments/learning spaces present their unique characteristics that support delivery techniques; hence, the second step. Teachers' capacity development in the delivery of digital content is dependent on the effective use of strategies. Micro-learning, flip learning, game-based learning and immersive learning are different strategies that could be used to deploy knowledge in the digital world.

1.8. Virtual learning technology infrastructure

Technology is simply a partner as Mishra and Koehler (2006) rightly branded it. Technology will not and cannot create content for us, nor choose strategies to adopt. It can, however, assist in content curation, and strategy formulation and delivery. Technology here refers to infrastructures properly integrated into the fabric of digital curriculum contents and strategies. Therefore, virtual classrooms for both synchronous and asynchronous delivery examples are learning management systems (LMS). A responsive and customised LMS technology is needed to host an online class. Moodle, Talent LMS, Blackboard, Coursera, Udemy, Alison, Edex and Khan Academy are examples of these categories. Assessment management system (AMS) for both synchronous and asynchronous deliveries should also be integrated into the LMS.

Finally, the monitoring management system (MMS) is also crucial in a virtual learning environment. Ensuring the proper functioning of virtual learning environment requires the following to be in place:

- Functional institutional email address for all the stakeholders;

- Seamless Internet connection within and outside institution vicinity;

- Building of LMS, MMS and AMS within the institution community;

- Building a digital community for young and old scholars;

- Bringing into the system talented and young minds – a drivers of digital community;

- The need for Instructional designers and developer/e-learning designers and developers.

2. Conclusion and Implications

In conclusion, repurposing African teachers for sustainable development requires that an African teacher is equipped with digital learning life skills that are the global online trends. Facing unprecedented events in our society is to be faced with flexible digital skills along with compatible pedagogical strategies. The global online trend is to migrate the teaching and learning processes completely to an online/virtual environment, which means three dependent approaches will have to be effectively considered. Teachers have been identified as the major actors in the achievement of the SDG 4 agenda (Kapenieks, 2020), using online/virtual teaching and learning environments as a tool. If they are not properly equipped to operate maximally and optimally in such an environment, all efforts to ensure sustainable teacher education towards the achievement of SDG 4 would be wasted. Therefore, this study proposes a virtual learning space model to equip teachers with necessary and requisite skills and competencies to transit into an online environment, where the teaching and learning processes will not be hampered by any unprecedented circumstances. Also, it proposes the adoption of the virtual learning space model (VLSM) because it is simple, flexible and adaptable, and clearly highlights the needed phases where a teacher can acquire the relevant ICT skills. It then implies that VLSM can be integrated into the teacher's preparation and training continually, since technology is an evolutionary field of study that is constantly growing and developing on the geometric curve. VLSM will constantly remind the teacher what needs to be implemented before any seamless migration to a virtual/online environment can occur. Additionally, the need for African teachers to integrate VLSM into their personal and professional, sustainable plan for teaching-learning sustainability is suggested. This will enable teacher education, as a major player in education for sustainable development, to reduce the current unsustainability attitudes in Africa that can impede the achievement of SDG 2030 target.

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