1

CORE OF DIGITAL-INFUSED COMPETENCE IN CREATING AN INNOVATIVE ACADEMIC ENVIRONMENT DURING THE COVID-19 PANDEMIC

Robert A. AWOYEMI[1]; Isaac S. AKINLUBI[2]; Oluwadolapo R.AWOYEMI[3]
College Library, Adeyemi College of Education, Ondo[1]; College Library, Federal College of Education (Special)[2]; Department of Linguistics and Languages, University of Ibadan[3]
akinawoyemi@yahoo.co.uk[1]; lubionline@yahoo.com[2];
awoyemioluwadolapo@gmail.com[3]

Abstract

Purpose: *The purpose of this study is to explore the core of digital-infused competence in the process of creating an innovative academic environment amidst the Covid-19 pandemic which resulted in the closing down of a large number of sectors in the economy, including the educational sector. In the situation where the physical school premises are inaccessible, teachers are required to adopt the use of digital technologies in order to engage students in the process of learning. Hence, the need for digital-infused competence.*

Design/Methodology/Approach: *The study adopted a conceptual review based on previous researches, employing a variety of databases to draw conclusion that it is only when teachers and students possess digital-infused competence that they would be enabled to utilize the full potential of digital technologies in the process of teaching and learning. A wide range of sources were consulted to ensure a broad and balanced review. These include published academic works, book chapters, academic journals and conference papers.*

Value/Originality: *Digital-infused competence has the capability of enabling teachers and students to exploit the full potential of digital technological features, hence they are required to acknowledge its relevance in order to maintain the process of teaching and learning.*

Keywords: *Academic Environment, Covid-19 Pandemic, Digital-Infused Competence, Students, Teachers.*

Paper type: *Conceptual/Exploratory*

Introduction

Since the establishment of schools as distinguishable academic environments, they have continued to thrive and expand exponentially regardless of diverse forms of disasters and calamities that have constantly threatened their overall continuity (Lundgren & Säljö, 2014). In the contemporary society, the outbreak of the Covid-19 pandemic has induced a number of massive restrictions, in which a large number of sectors in the economy are being closed down, including the educational sector. Thus, bringing about the suspension of academic activities. According to Falloon (2020), the decision to temporarily close down schools was prompted on the basis that large gatherings of persons constitute a severe risk to safeguarding public health during the Covid-19 pandemic.

Thus, in the situation where the physical school premises are inaccessible, teachers are required to acknowledge other innovative means of engaging students in the process of learning. Starkey and Yates (2020) posit that over the span of two decades, the Internet, computational devices, software applications, websites and other digital technologies have proven to be of huge benefit to the educational system. Therefore, it is required now more than ever that teachers and students take advantage of the growing capabilities of digital technologies in the process of teaching and learning. However, in their study, Borthwick and Hansen (2017) observed that in order for teachers and students to take the full advantage of digital technologies, they are required to possess digital-infused competence. Baz, Balçıkanlı and Cephe (2018) affirm that the drastic transformations that have taken place in other fields such as banking,

engineering, commerce and recruitment was made possible with the aid of digital-infused competence. Thus, by possessing digital-infused competence, teachers and students are enabled to bring a major transformation in their process of teaching and learning.

According to Scott & Morrison (2019), the notion of digital-infused competence provides a conceptual basis for how teachers and students will engage in an innovative academic environment. Digital-infused competence in the academic environment does not only imply the ability of teachers to utilize digital technologies in the process of teaching but also the organization, calibration and management of the digital learning environment to harmonize the learning process with specific courses and course contents in order to reinforce the academic success of students (Starkey, 2020). Thus, it is required that both teachers and students endeavor to possess digital-infused competence in the 'confirmed society' so as to expedite the process of teaching and learning in spite of the restrictions that have been caused by the outbreak of the Covid-19 pandemic.

The Covid-19 Pandemic

Over the span of two decades, coronaviruses (CoVs) have been linked to significant disease outbreaks in East Asia and the Middle East. Hence, the Severe Acute Respiratory Syndrome (SARS) and the Middle East Respiratory Syndromes (MERS) began to emerge in 2002 and 2012, respectively. However, at present, a novel coronavirus, the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), causing the Coronavirus Disease 2019 (COVID-19), emerged in Wuhan City, Hubei Province, China, on December 12th, 2019, and has rapidly spread throughout the country and subsequently to other countries. Due to the severity of this outbreak and the potential of spreading on a global scale, the World Health Organization (WHO) declared a "global health emergency" on January 31st, 2020. Subsequently, on March 11th, 2020, a pandemic situation was declared. In the past two decades, the current emergence of Covid-19 is the third CoV outbreak in the human society.

Coronaviruses are a large family of viruses which may cause disease in animals or humans. Dhama, Sharun, Tiwari and Sircar (2020) purport that there are several types of coronaviruses that are capable of infecting humans but on an average people only get infected with these four coronaviruses: 229E, NL63, OC43, and HKU1. They usually cause respiratory infections ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS) and the most recently discovered is Covid-19. The WHO originally called this infectious disease Novel Coronavirus-Infected Pneumonia (NCIP) and the virus had been named 2019 novel coronavirus (2019-nCoV). On 11th February 2020, WHO officially renamed the clinical condition Covid-19 (a shortening of Corona Virus Disease-19), which was announced in a tweet.

The virus is typically rapidly spread from one person to another via respiratory droplets produced during coughing and sneezing. It is considered most contagious when people are symptomatic, although transmission may be possible before symptoms show in patients. Time from exposure and symptom onset is generally between two and 14 days, with an average of five days. Common symptoms include fever, cough, sneezing and shortness of breath. Complications may include pneumonia, throat pain and acute respiratory distress syndrome. Currently, there is no specific antiviral treatment or vaccine; efforts consist of symptom abolition supportive therapy. Awoyemi and Ojo (2020) posit that recommended preventive measures include washing of hands with soap, covering the mouth when coughing, wearing of facemasks, maintaining of at least 1-meter distance from other people, decreasing of mass social gathering and monitoring and self-isolation for fourteen days for people who suspect they are infected.

Digital-Infused Competence

To thrive in the 21st century's innovation-driven economy, both teachers and students require a

different mix of skills than in the past. In addition to foundational skills like literacy and numeracy, they require digital-infused competence, such as virtual learning management, content development, metadata development, electronic database searching, network consortia access, collaboration, creativity, critical thinking and problem-solving abilities. Aldosemani (2019) observed that changes in the contemporary society have immensely heightened the need for all 'change agents' (such as teachers, librarians, consultants and public health workers) to possess digital-infused competence. At present, countries around the world operate their economies and sectors based on creativity, innovation and collaboration. Thus, jobs and businesses are increasingly centered on the application of digital technologies in the process of solving unstructured problems, seamlessly transferring information and effectively analyzing data.

Kimmons and Hall (2018) purport that in 1997, the Organization for Economic Co-operation and Development (OECD) launched the DeSeCo Project, with the aim of providing the conceptual basis required to identify key competences, or competences that individuals need to acquire to be prepared for life's challenges. These life challenges included, individual demands employability, personal development as well as collective challenges, such as balancing economic growth with environmental sustainability, and success with social equity. With regards to these life challenges, the competences required by individuals to meet their goals became more complex, requiring more than the mastery of certain narrowly defined skills.

According to Kleiner and Lewis (2017), the European Commission gradually acknowledged the importance of life-long learning as a response to the ongoing globalization and the shift towards knowledge-based economies, and already, in 2005, urged Member States to adapt their educative systems to provide the young with the key competencies required to engage in life-long learning. The recommendations of the European Commission on key competences for life-long learning identified a set of eight competencies that all individuals need for personal fulfilment and development, active citizenship, social inclusion, and employment. One of these eight competences was digital-infused competence.

According to Lund and Furberg, (2014), digital-infused competency is regarded as the creative, critical and safe use of digital technologies to attain goals related to work, employability, learning, leisure, inclusion and social participation. Fraile, Vélez and Lacambra (2018) perceived digital-infused competence to be the ability to apply digital skills (such as, information and data literacy, online communication and collaboration, digital content creation, safety and problem-solving abilities) in a confident, critical and responsible way in a defined context. Sardone (2019) defined digital-infused competence as a set of skills that enable individuals to access the internet, find, manage and edit digital information; join in communications, and otherwise engage with in online information and communication network.

Since digital-infused competence has become increasingly linked to the extensive use and application of digital technologies for ubiquitous access to the internet, and the proliferation of personal mobile digital devices. Terms such as 'information literacy', 'computer literacy', 'internet literacy', 'media literacy', and most recently, 'multi-modal literacy' have all been used to associate digital-infused competence and the effective use of digital resources in the process of teaching and learning. Cheng (2019) however opined that reaching a particular definition of digital-infused competence is challenging, due to constantly evolving technological, cultural and societal landscapes redefining what, when and how digital technologies are used in individual and professional activities.

With regards to this, Fallon (2020) urged educational administrators to make efforts to adopt the constantly evolving digital technology capabilities amidst the Covid-19 pandemic, in belief that it would ensure higher-order digital-infused competence and also improve the process of learning. Evidences from past literatures support the claim that the adoption of digital technologies for teaching and learning activities has the capability of improving motivations and curiosities for learning and

reinforcing the necessary skills for the productive use of digital technologies. Additionally, further reviews have shown that the integration of digital technologies does not only significantly enhance practical knowledge of applications and programs, but also contributes to developing skills and fosters an active and autonomous role of students.

In their study Hobson and Bransford (2020) observed that there is an increasing awareness among experts and academics that, for the process of learning to persist in the confirmed society, digital technologies are required to be used in supporting subject learning and impacting on students' subject-specific learning processes, and that digital technologies have only a limited effect on learning and teaching without the aid of digital-infused competence. Thus, the lack of digital-infused competence would result to a situation where teachers would be limited to applying minimal features of digital technologies, without realizing that effective interactivity requires a new approach to pedagogy and the curriculum. Hence, this highlights the need to ensure adequate development of the digital competence of teachers.

Techniques for Developing Digital-Infused Competence

Digital-infused competence does not only involve the technical mastery of digital technologies, but also the development of capabilities to; browse, evaluate, and manage data; communicate, collaborate and participate; create, edit and share digital contents; preserve safety; and solve problems in both formal and informal learning contexts. Harrison (2017) observed that the development of digital-infused competence also requires outlooks and values that enable the user to adapt to the new needs invigorated by digital technologies, their appropriation and adaptation to their own purposes, and the ability to interact socially around them. Digital-infused competence allows individuals to take advantage of the wealth of knowledge and new possibilities associated with digital technologies and the challenges they pose in the new knowledge-driven society.

Digital-infused competence enables the literates to fully develop as professionals and gain active membership in a society that is surrounded by myriads of information resources. Foulger and Schmidt (2017) assert that, for teachers who are architects of their teaching-learning processes, being digitally competent implies being able to effectively integrate digital technologies as part of the teaching process in order to transform it. Uerz, Volman and Kral (2018) purport that the core of effective teaching with digital technology is the understanding that emerges from interactions among content, pedagogy, and technology knowledge, and evidences from past literatures reveal that when teachers employ their knowledge of both the subject and the way students understand the subject, their use of digital technologies has a more direct effect on the students' attainment.

Hence, digital-infused competence is the teacher's proficiency in using digital technologies in a professional context with good pedagogic-didactic judgment and his or her awareness of its implications for learning strategies and the digital building of students. Sessanga and Musisi (2019) proposed some techniques and practices that are effective in developing digital-infused competence. These techniques are briefly discussed below:

Project-Based Learning: Several researches on project-based learning have vividly illustrated significant benefits for individuals who work collaboratively in developing digital-infused competence in contrast to individuals who work alone. Thus, in order to develop digital-infused competence individuals are required to work collaboratively and encourage knowledge sharing. Likewise, Toom, Pyhältö and Rust (2015) posit that in the academic environment, students who have difficulties with the traditional classroom learning significantly benefit from project-based learning experience which further aligns them with the learning process. Best practices for project based learning in developing digital-infused competence include, appending project outcomes to objectives and goals, employing question-answer method to align individuals with central concepts and principles, individual responsibility for designing and managing most of their

learning, and basing the learning process on authentic, real problems and circumstances that would serve as an interest for the individuals.

Problem-Based Learning: Problem-based learning serves as a technique of digital-infused competence development which enables individuals to develop and focus on complex, real-world problems using a case study approach. Beisel (2017) posit that when individuals work in small groups to research and provide solutions to problems, both an innovative and multifaceted environment is created. Within this environment, individuals can explore multiple solutions and select best method for tackling problems they encounter. Literatures and meta-studies of research that were focused on problem-based learning revealed that for innovative learning, problem-based learning has similar impacts to traditional learning methods but that problem-based learning does not exceed traditional learning methods when skills such as technological competency, critical thinking, interpersonal communications, collaborations and application of knowledge to real world situations are being measured.

Design-Based Learning: Design-based learning has constantly proven to have the most impact in the technological purview. Popular design-based learning activities include algorithm design and troubleshooting exercises, where individuals team up and design, build and monitor their algorithms in a collaborative and participative environment. Various literatures on design-based learning have revealed that individuals who participate by designing projects have a more systematic understanding of a system's parts and functions. However, obstacles that hinder design-based learning include, the inability of tutors to effectively choose activities and themes that are not restricted by differing viewpoints of learners; the need to strategically select individuals who will collaborate effectively; and the encouragement of multiple strategies to establish deeper collaboration and improve the better outcomes for the group.

The Need for Digital-Infused Competence in the Confined Society

Following the outbreak of the Covid-19 pandemic in the contemporary society, organizations and sectors in the economy have been exploring various alternatives of staying operational, based on the premise that large gatherings of persons constitute a severe risk to safeguarding public health and the spread of Covid-19. These alternatives of staying operational have consequently resulted in the adoption of digital technologies. Hence, the need for digital-competence. The present digital technology based society requires new job requirements, new roles, adequate competence and different types of skills, which would enable the development of new forms of products and services in response to the Covid-19 pandemic.

Based on this, Falloon (2020) purport that existing staff must be well trained and competent in the digital technology sphere in order to stay relevant in the global competition market. However, Awoyemi (2019) posit that skills and competencies once acquired do not guarantee a lifetime survival in the constantly evolving technological world. There is need to frequently update skills and competences through lifelong professional development programmes. Thus, individuals with adequate digital-infused competence and proactive attitude can further excel in their new role as digital connoisseurs, information professionals, knowledge navigators and innovation facilitators.

In various literatures, the term skill and competence have been used interchangeably, however it is very significant to distinguish them. According to Heydon (2007), skill refers to a practical ability, a facility in carrying out an action whereas, competence is often defined as the inherent attribute and mental ability that govern how an individual interact with the world. Competence enables individuals to contribute positively to their organizations and profession. Skill can be seen in an action in the way an individual carries out a task. Competencies are hidden inside an individual but influences how he/she uses his skills. Thus, competences are the skills, technical knowledge and personal attributes that contribute to an individual's success in a particular position. While skill is the capability acquired by a person through training to successfully complete a job.

In the contemporary environment, teachers owe much greater responsibility to be efficient information professionals. Taking closer view at the restrictions induced by the outbreak of the Covid-19 pandemic, teachers not only need to acquire wider range of competence but also need to keep themselves well updated in the technological sphere. McKenney (2020) assert that the need for maintaining and preserving digital-infused competence would enable teachers to be more prolific and gain more reputation in the contemporary society. Thus, teachers are required to maintain a flexible working skill, they must be readily open to new ideas, they are required to possess critical thinking and lifelong learning skills, and must always maintain a personal attention and always care about the educational needs of students.

The strategic changes taking place in the world demand that teachers must remain compliant and adaptive in order to move in sync with the changes. Realizing the fast upcoming tide of innovations, teachers must not only possess digital-infused competence but also technical competence, collaborative competence and managerial competence as the world is in transition. Thus, adopting new competence is the demand at hand for a number of reasons including, fast incoming technological innovations and emerging structural changes to prepare teachers and individuals for the transition in their daily tasks and work culture of their organization or to provide transferable competence to enable individuals to be prepared for upcoming job opportunities anywhere.

One may not possess all the competences to perform effectively in a current task because the task itself is changing. The style of performing a task by innovative experts and professionals is also contributing to the perception of how a task is required to be performed. However, it is not always possible to recruit individuals who possess innovative skills. Therefore, the solution is to provide regular development opportunities to the already existing staff in order to prepare them for their new roles. This is possible by continuing the process of innovation development in order to maintain job effectiveness in the changing digital world and to meet the demands put upon them by the immediate society.

Teachers are required to continue to learn, update and refresh their knowledge to prevent the onset of professional alienation in performance and to adjust to the culture and change prevalent in the new environment that is governed by digital technologies. Holmes and Gardner (2020) observed that since educational administrators are not solely in the position to replace all the existing teaching staff with new staff, they are required to ensure training and development for the existing staff to keep them well-updated. With the increase of pressure on teachers to keep up-to-date, and to maintain and improve productivity, attending innovation development courses and lectures is required from time to time.

Regular teacher conferences must shift focus to training on digital-infused competence in the educational sphere. Today with the evolution and invention of new forms of digital technologies and global competition, new hybrid competences and higher-order skills are required to become more teaching-sensitive and student-centered. Therefore, in order to survive and sustain in the present environment, teachers and individuals at large are required to possess combination of generic, traditional and digital related competences, such as, virtual learning management, digital information retrieval, content development, metadata development, electronic database searching, network consortia access, etc.

Creating an Innovative Academic Environment with Digital-Infused Competence

Over the span of time researchers have encouraged the development of innovative academic environments by employing digital technology experts such as instructional designers, courseware technologist and graphic designers (Geer, White & Barnes, 2017). These digital technology expert possess digital-infused competence and allow for the appropriate mitigation of operations in order to enhance the quality of projects. Not only is digital-infused competence needed but so are the adequate participation of teachers and students to become agents of change. Several roles of

digital-infused competence in developing an innovative academic environment include competence, commitment, communication and collaboration. Therefore, in order to create an innovative academic environment, teachers as well as students are required to possess digital-infused competence, along with setting of expectations, communicating frequently, and putting of feeling of vulnerability in self efficacy aside.

Building an Active Learning Environment: According to Bloom and Doss (2019), an active learning environment is virtual classroom where instructions, learning activities, learning products and assessments are tailored to individual learner's, strengths and interests. When learning is based on an active environment, students are enabled to spend less time on assignments that are redundant or irrelevant to their learning needs, but instead have focused time for experiences that allow for critical and creative thinking. Digital technologies are capable of making active learning possible and unrestricted. Ferlazzo (2018) described an active learning environment as a virtual setting where students begin the week by posting learning goals and then have the liberty to determine how they tackle their learning goals and how they are assessed.

Students are enabled to be creative in choosing and designing products that demonstrate their learning. For instance, if a student is interested in medicine or engineering, he/she is enabled to access resources and projects that give deep insights into such topic. Active learning also involves allowing students to generate their own unique solutions to problems and to develop contents with a variety of media formats to demonstrate what they have learned. An example of an active learning environment is PlayPosit. It is an easy-to-use tool that allows for teachers to use video lessons from sites like YouTube and TeacherTube, add interactive components, and embed assessment items. PlayPosit also provides data about students' use and performances on assessments. Therefore, teachers are enabled to personalize lessons for students on a "need to know" basis for problem or project based units and other individuals or small group learning needs.

Integrating an Appropriate Learning Management System (LMS): Digital technologies enable the integration of Learning Management System (LMS) which engages students in their curriculum and deliver traditional instruction in didactic ways. According to Starko (2015), the LMS is formally regarded as a software system for delivering, tracking and managing the learning process of students. An LMS is only as strong as its arrangement, contents, and the willingness for individuals to use it. Therefore, efforts are required to be taken in order to heighten students' experiences through engagement with and understanding of the course content, achieving of learning objectives and incorporating of institutional and course-specific assessment.

With the aid of the LMS course topics are capable of being grouped into modules in order to be implemented as desired in the course. This ensures that each course covers the same topic regardless of subject and contents, level of education, or institution. Also, one course is capable of implementing all topics and modules, while another course can employ one module that is aligned to its particular subject area. The LMS also provides structure and customizability to the modules, thus allowing teachers to choose the themes and activities to include and the order in which to include them. Students using the modules are not only enabled to access materials in the LMS but also enabled to make extensive use of digital technologies in their learning activities, thus boosting their digital-infused competence.

Kelentriç and Helland (2019) observed that engaging with digital technologies in the process of learning would further encourage students to interact more collaboratively. Thus, students are enabled to participate in online-scenario based interactions with vast number of their colleagues from other schools in different parts of the world. The use of digital technologies also provides an avenue for students to share educative multimedia files out to the LMS in other to communicate and reflect on extracurricular activities they participated in that are related to their individual modules. An effective LMS gives room for students to visit websites and access information contents in

order to synthesize new course materials and generate their course contents.

Instructional Design for Promoting Active Learning: While it is often tedious to develop sustainable materials that are capable of being implemented across varied media, disciplines, and audience, employing collaborative learning method, innovative technologies and experiential learning opportunities (either in real life or as authentic web-based scenarios), flexible materials are capable of being created to address the individual needs of students. Alessi and Trollip (2019) posit that students are enabled to benefit from authentic collaborative activities that would allow them to experientially gain knowledge, competence and acquire self-awareness of their attitudes and beliefs regarding the topics and subject matters covered. Thus, encouraging students' construction of knowledge and ideas should begin with experiential learning strategies and collaborative learning strategies, which are to be embedded in their curriculum and learning environments.

Experiential Learning: The concept of "learning by doing" has taken on a number of identities throughout the years, having been well-rooted in experiential learning, problem-based learning and inquiry-based learning to name a few. Experiential learning opportunities connect and reinforce the critical linkages among education, work, and personal development and are fitting for both traditional and advanced teaching modes. Biswajit (2019) observed that since the contemporary society requires individuals to possess digital-infused competence it is advisable to encourage students to reconstruct their knowledge in order to take a step further into redesigning their curriculum.

Collaborative Learning: Using collaborations or relatively long term participatory-focused, and meaningful units of instruction that integrate concepts from a number of disciplines can motivate students to construct and take ownership of their own learning, which in turn transfers to real-life experiences. Collaborative learning is capable of promoting deeper understanding of a discipline as students actively construct meanings embedded in their various learning processes. In digital technology-integrated collaborative learning situations, students are presented with significant real-world information and are then instructed to solve problems collaboratively, in order to enhance their existing knowledge. Collaborative learning technologies enable students to learn by participation, visualize and model compels concepts, thus bridging the gap between schools and communities.

Perspectives of Digital-Infused Competence for Teachers

The increasing prevalence of digital technologies in the contemporary society demands teachers to possess digital-infused competence. According to Starkey and Yates (2020), the acquisition of digital-infused competence by teachers includes three core components which are, learning how to teach with digital technologies, management of the virtual learning environment and how to be a technology-oriented teacher. Zeichner (2019) purport that the notion of digital-infused competence for teachers provides a conceptual basis for considering how teachers are required to be prepared for the innovative academic environment. With regards to this, a digitally competent teacher does not only utilize digital technology in his/her teaching, but also organizes, designs and manages the virtual learning environment; application of digital technology in the development and maintenance of the virtual learning environment for their students.

According to Guskey (2017), in terms of digitally competent teachers, carrying out the process of teaching implies the prioritization of technical skills in using digital technologies and systems deemed for the appropriate to educational settings, and identifying how these can be used within particular units of learning. With regards to this, teachers are required to be enabled with a set of basic competencies that can be transferred to their classroom practice. However, this approach has been criticized for its narrow skill focus, lack of authenticity, failure to take account of different sociocultural contexts for technology use, and its ineffective, reductive design. Other limitations identified were based

on a wider consideration such as, ethical, digital citizenship, health, wellbeing, safety and social/collaborative elements.

In consideration of the nature of general digital-infused competence, Janssen, *et al.* (2018) posit that digital-infused competence plainly involves more than the knowledge of how to use digital technologies and software applications. Rather the sensible and healthy use of digital technologies requires advanced knowledge and attitudes regarding legal and ethical aspects, privacy and security, as well as understanding the complex role of digital technologies the in society and a balanced attitude towards technology. Sutton (2019) asserts that not only did the conceptualization of 'Janssen, Stoyanov, Pannekeet and Sloep (2018)' acknowledge the relevance and importance of digital-infused competence, it also adopts *a* wider socio-cultural viewpoint by indicating the need to understand and consider larger implications and effects of digital technologies on individuals and the society at large.

It also introduces dispositional and attitudinal elements or what Janssen *et al*. (2018) terms developing a "mind-set" towards digital innovations, in an effort to better understand and critically evaluate their role and influence in forming new practices. Klebansky and Fraser (2020) observed that this represents a considerable challenge for teacher, who not only need to better support their students to more effectively utilize digital technologies in their prospective classrooms, but must also help them understand and develop a concern for wider considerations around digital technology use, and its impacts. More so, the notion of digital-infused competence implies a need for constant revision, reflecting changes to technological systems and uses, taking into account the evolving nature of digital technologies. This requires the teacher to constantly reflect on current capabilities and where necessary, provide access to learning and respond to the rapidly changing educational environment and opportunities offered by emerging digital technologies.

Strategies for Teaching with Digital-Infused Competence

Once teachers possess digital-infused competence, they are required to become prolific and possess the capability of teaching in the innovative academic environment. Teachers would be obliged to take conscious efforts to communicate and collaborate with other teachers and students, thus becoming flexible in managing new teaching dynamics. Teachers are also required to support and encourage independent learning of students, and willing to adopt their teaching styles to accommodate new approaches to innovations and new pedagogy in learning. For this to take place, Akçayır and Akçayır (2020) purport that teachers will need professional development opportunities and strong support systems.

The professional development of the educational standard as a whole is required to be the main focus of teachers. Thus, teachers would also become learners in the new sea of digital innovations. Developing advanced capability of teaching in the innovative academic environment requires flexible and coordinated leadership. All teachers are to endeavor to reflect and learn from each other's experiences as new techniques and processes are piloted and integrated. With regards to the assessment of students, Basri and Almadani (2020) posit that it is essential to guide learning and provide interactive feedbacks to students in order to prompt the inherent participatory ability and ensure the academic success of students. Thus, Lund and Briggs (2020) recommended that:

1. Assessment systems be based on multiple measures of students' individual abilities
2. Students construct knowledge rather than passively ingest information
3. Sophisticated information gathering tools are required extensively to simulate students to focus on experiential-based learning rather than theoretical-based learning
4. Collaborative interactions and team based approaches should be encouraged
5. Curating, assessing and analyzing of information contents should be a major priority of teachers

Naidu (2020) further posits that, with regards to creating an innovative academic environment, individual school administrators should invest in curriculum, professional development and critical thinking schemes. Focuses are required to be shifted towards potentials that are capable of enhancing and measuring of thinking skills of students. Although, it is quite possible to assess critical thinking skills with theoretical techniques, Victoria (2020) suggested that it is advisable to implement innovations and state-of-the-art critical thinking assessments that would further bring about greater creativity in students. However, the development of innovative academic environments is in their early years, school administrators and teachers are required to remain relentless in providing expedient learning environments for students.

The Impact of Digital-Infused Competence on the Roles and Skills of Teachers: Digital-infused competence has gradually changed how teaching is being carried out in the modern society. The format of information contents has also drastically changed from paper-based to digit-based and students are enabled to access these digital-based information contents in various ways. Thus, teachers are being transformed from mere textbook tutors and custodians of the physical classroom to information professionals and disseminators of various formats of information contents. Based on these transformations, Aldosemani (2019) purport that new designations of teachers have emerged such as, information managers, content curators, online learning managers and critical-thinking evaluators. Teachers in the contemporary world are now being entrusted with the role of securing several databases, online archives, curriculum algorithms and biodata management of students.

Therefore, they are required not to only possess digital-infused competence but also other prolific skills as they are being given new roles. Thus, in order to take part in the changing paradigm of the academic sphere, teachers are required to continuously search for innovative means of enhancing their knowledge, competences and skills in the extensive application of digital technologies in their teaching process. They need to acquire in-depth knowledge of digital information resources and their management in order to meet the strategic information needs of the students. The types of skills teachers must possess in the contemporary knowledge driven world includes:

Content Development Skills: Content development is considered to be a highly challenging task because it is required to always meet and serve the immediate information needs of students. Hence, the teachers are required to have thorough knowledge of the wide range of digital information content that are available on the web and online information databases. If a particular information content is not available on the Learning Management System (LMS), the teacher is required to have the knowledge of sourcing for such information on the web. The teacher is also required to have the knowledge of distinguishing between valid and invalid information contents so as not to delude students.

Information Dissemination Skills: Information dissemination skill is another crucial skill that teachers must possess in the contemporary society. There are quite a number of students that are designated to each teacher to supervise and tutor, and these students are required to be given information content in a rapid and synchronized manner. Thus, the teacher is required to possess the skill of disseminating information contents to students expediently and sim simultaneously. Teachers are required to be proactive and well aware of the basic media through which information contents can be rapidly disseminated to students. With regards to the dissemination of information contents, the teacher could utilize, Bluetooth, Wi-Fi, USB cables, email and social media.

User-Education Skills: Since students generally become 'users' of digital technology in the process of learning, teachers are required to possess user-education skills in order to educate students on how to effectively and properly apply digital technologies in their process of learning. With regards to user-education, teachers are being given a very crucial duty of orienting students on the various features of digital technologies in terms of accessing, and operating in the virtual learning environment.

Thus, teachers are required to guide students in order to develop their skills of accessing, editing, storing and sharing of information contents with the use of digital technologies.

Lifelong Technology Acquisition Skills: Digital technologies in the contemporary society are always evolving, such that a particular piece of technology could suddenly become obsolete. Major developments and innovations are always taking place in the technological sphere. Thus, teachers are required to always align with the technological trends in the society. They are required to always try as much as possible to acquire cutting-edge technologies that are suitable to serve the various information needs of students.

Conclusion

Education has continued to thrive in the human society over the course of time. It has been regarded as a priceless asset which serves a unique beneficial purpose to both individuals and the society at large. Over the years, a copious number of measures have been taken in order to sustain and improve the standard of education. Majority of these improvements in the educational standard has been centered on the adoption of digital technologies, thus, bringing about the need for digital-infused competence. With the aid of digital-infused competence, teachers and students are equipped with the essential knowledge and skills needed to actively function in the present digital technology-based society. More so, the outbreak of the Covid-19 pandemic which has caused restrictions in the contemporary society further reinforces the need for educational administrators to adopt digital technological features as means of engaging students in the process of learning. However, in order to utilize the full potential of digital technologies in the process of teaching and learning, it is required that teachers and students possess digital-infused competence. Hence, this study has provided a body of literature that would further underpin the relevance of digital-infused competence in the contemporary society.

References

Akçayır, M., & Akçayır, G. (2020). Advantages and challenges associated with augmented reality for education. *Educational Research Review*, *20*(3), 1-11.

Aldosemani, T. (2019). In-Service Teachers' Perceptions of a Professional Development Plan Based on the SAMR Model: A Case Study. *The Turkish Online Journal of Educational Technology, 18*(3), 46-53.

Alessi, M., & Trollip, R. (2019). Multimedia for Learning: Methos and Development. Ally and Bacon, (3rd Ed.). Hershey PA, USA 17033.

Awoyemi, R. A. (2019). Core Competencies and Innovation for Library and Information Science Professionals in 21st Century Digital-Based Environments. In J. Keengwe, & R. Byamukama (Eds), Handbook of Research on Promoting Higher-Order Skills and Global Competencies in Life and Work (pp. 264-280). Hershey PA, USA 17033.

Awoyemi, P. N., & Ojo, O. (2020). Viruses: Coronavirus Disease 2019 (Covid-19) in Focus. Doi. 10.13140/RG.2.2.26781.91047

Basri, W., & Almadani, F. (2018). ICT Adoption Impact on Students' Academic Performance: Evidence from Saudi Universities. *Education Research International*, *2*(4), 31-40.

Baz, E., Balçıkanlı, C., & Cephe, P. (2018). Introducing an Innovative Technology Integration Model: Echos from ELF Pre-Service Teachers. *Education and Information Technologies, 23*, 2179–2200.

Beisel, C. (2017). New or Novice Teacher Integration of Mobile Learning Instruction. Doctoral dissertation. Walden University. https ://schol arwor ks.walde nu.edu/disse rtations/4349/.

Biswajit, S. (2019). Knowledge Management: Strategy, Technology and Application, Proc. of Intl. Conf. on *Information Management (ICIM) in a Knowledge Society*, (pp.674-686).

Bloom, L. A., & Doss, K. (2019). Using Technology to Foster Creative and Critical Thinking in the Classroom. In J. Keengwe, & R. Byamukama (Eds), Handbook of Research on Promoting Higher-Order Skills and Global Competencies in Life and Work (pp. 70-84). Hershey PA, USA 17033.

Borthwick, A., & Hansen, R. (2017). Digital Literacy in Teacher Education. Are Teacher Educators Competent? *Journal of Digital Learning in Teacher Education, 33*(2), 46–48.

Cheng, M. M. (2019). Re-Conceptualizing Professional Competence Development of Student Teachers in Initial Teacher Education. *Research Papers in*

Education, 1-24. doi:10.1080/02671522.2019.1633563

Dhama, K., Sharun, K., Tiwari, R., & Sircar, S. (2020). Coronavirus Disease 2019 – COVID-19. https://www.researchgate.net/publication/340608951

Falloon, G. (2020). From Digital Literacy to Digital Competence: The Teacher Digital Competency (TDC) framework. *Education Technology Research Development*, 1-24. https://doi.org/10.1007/s11423-020-09767-4

Ferlazzo, L. (2018). Student Engagement: Key to Active Learning. *Research and Educational Leadership, 4*(6), 56-72.

Foulger, T., & Schmidt, C. D. (2017). Teacher educator digital competencies. *Journal of Technology in Teacher Education, 25*(4), 413-448.

Fraile, M. N., Vélez, A. P., & Lacambra, A. M. (2018). Development of Digital Competence in Secondary Education Teachers' Training. *Education Sciences,* 1-12. www.mdpi.com/journal/education

Geer, R., White, B., & Barnes, A. (2017). Emerging Pedagogies for the Use of iPads in Schools. *British Journal of Educational Technology, 48*(2), 490-498.

Guskey, T. R. (2017). Professional Development and Teacher Change. *International Journal of Technologies for Teachers*, *8* (4), 381-391.

Harrison, C. (2017). Critical Internet Literacy: What is it, and how should we Teach it? *Journal of Adolescent & Adult Literacy, 61*(4), 461-464.

Heydon, R. (2007). Making Meaning Together: Multi-Modal Literacy Learning Opportunities in an Inter-Generational Art Programme. *Journal of Curriculum Studies, 39*(1), 35-62.

Hobson, L. M., & Bransford, S. (2020) A Comprehensive Framework for Creating Self-Determined Learners amidst the Covid-19 Pandemic. In, *the future of ubiquitous learning* (pp. 25-40) Berlin: Springer.

Holmes, B., & Gardner, J. (2020). E-Learning in the Constrained Environment: Concepts and Practice. *Journal of Technology in Teacher Education, 22*(4), 471-495.

Janssen, J., Stoyanov, S., Pannekeet, K., & Sloep, P. (2018). Experts' Views on Digital Competence: Commonalities and Differences. *Computers & Education, 68*, 473-481.

Kelentriç, M., & Helland, K. (2019) *Professional Digital Competence Framework for Teachers. The Norwegian Centre for ICT in Education*: Tromsø, Norway.

Kimmons, R., & Hall, C. (2018). How useful are our Models? Pre-Service and Practicing Teacher Evaluations of Technology Integration Models. *TechTrends, 62*, 29-36.

Klebansky, A., & Fraser, S. (2020). A Strategic Approach to Curriculum Design for Information Literacy in Teacher Education: Implementing an Information Literacy Conceptual Framework. *Australian Journal of Teacher Education, 58*(21), 103-125.

Kleiner, B., & Lewis, L. (2017). *Educational technology in teacher education programs for initial licensure*. Washington, DC: National Center for Educational Statistics, U.S. Department of Education.

Lund, B. D. & Briggs, T. (2020). Effect of Virtual Reality on Learning Motivation and Academic Performance. *Kansas Library Association College Proceedings, 9*(1), 1-7.

Lund, A., & Furberg, A. (2014). What does Professional Digital Competence Mean in Teacher Education? *Nordic Journal of Digital Literacy, 9*(4), 281-299.

Lundgren, U.P. & Säljö, R. (2014). Professional Digital Competence in Teacher Education. *Nordic Journal of Digital Literacy, 9*(4), 243-249.

McKenney, S. (2020). TPACK in Teacher Education: Are we Preparing Teachers to Use Technology for Early Literacy? *Technology, Pedagogy and Education, 26*(1), 69-83.

Naidu, S. (2020). Technology, Education and Design: The Sciences of the Artificial. *Resource Book on ICT Integrated Teacher Education*. ISBN: 978-81-88770-30-4. Pp46-60.

Sardone, N. (2019). Developing and Engaging Learning Experience in Preservice Education. *The Clearing House: Journal of Educational Strategies, Issues and Ideas, 92*(6), 235–245.

Scott, D. and Morrison, M. (2019). *Key Ideas in Educational Research*, London: Continuum.

Sessanga, J. B., & Musisi, B. (2019). The Role of Teacher Education in Developing Employability Skills in Higher Education. In J. Keengwe, & R. Byamukama (Eds), Handbook of Research on Promoting Higher-Order Skills and Global Competencies in Life and Work (pp. 85-98). Hershey PA, USA 17033.

Starkey, L. (2020). A Review of Research Exploring Teacher Preparation for the Digital Age. *Cambridge Journal of Education*, *50*(1), 37-56.

Starkey, L., & Yates, A. (2020). How do Student Teachers Learn Professional Digital Competence? *Australasian Journal of Educational Technology, 33*(3), 46-60.

Starko, A. (2015). Creativity in the Classroom: Schools of Curious Delight (5th ed.). New York , NY: Routledge.

Sutton, S. (2019). The Preservice Technology Training Experiences of Novice Teachers. *Journal of Digital Learning in Teacher Education, 28*(1), 39-47.

Toom, A., Pyhältö, K., & Rust, F. O. C. (2015). Teachers' Professional agency in Contradictory Times. *Teachers and Teaching*, 21(6), 615-623.

Uerz, D., Volman, M., & Kral, M. (2018). Teacher Educators' Competences in Fostering Student Teachers' Proficiency in Teaching and Learning with Technology: An Overview of Relevant Research Literature. *Teaching and Teacher Education, 70*, 12-23.

Victoria, S. (2020). Apprehending the Past: Augmented Reality, Archives, and Cultural Memory. In J. Sayers (Eds.), *the Routledge Companion to Media Studies and Digital Humanities*. (pp 372-383). Clarendon Press, Oxford.

Zeichner, K. (2019). The Turn Once Again Toward Practice-Based Teacher Education. *Journal of Teacher Education, 63*(5), 376-382.