



Teachers' Current Technological Challenges and Expectations for Futuristic Learning in a Knowledge-Based Economy

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Abstract: What is permanent in this world is change. The world is on the move and technology is affecting every aspect of life and the education sector is not left behind. Presently, the education sector is going through several changes, and the old-fashioned technique of teaching-learning is no longer suitable for the digital and/or knowledge-based society. Student enrolment rate is constantly on the increase on daily basis. Consequently, future education needs digitally skilled teachers to respond to the futuristic pedagogy that will respond to the learning needs of 21st-century generation students. Futuristic education is a type of modern teaching-learning that will encourage classroom engagement and enlargement, and learning for students to use modern or technological approaches to instruction in educational institutions that will facilitate students' intellectual, social, and emotional development. This study reviewed some vital literature, reviewing some scholarly publications on the topic by x-raying vital contributions made by various researchers and/or scholars, and institutions. The paper correspondingly attempts to identify current teachers' challenges that will hinder the future teaching-learning process, and offer possible suggestions that will meet the future needs of higher education, particularly in the Nigerian context. The significance of the study is to remind teachers to build their technological skills for futuristic teaching-learning by using technologies effectively, and also offer them the opportunities to address the present challenges confronting the modern teaching approach to effectively organize how students' engagement will be carried out in the future, with the hope of providing quality education for all learners.

Keywords: Educational technology, Futuristic education, Knowledge-based Society, E-learning, Digital learning and Future skills.

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INTRODUCTION/REVIEW OF RELATED LITERATURE

Brar (2017) avowed that the purpose of education in any country is to prepare the youths for an effective future living in a changing society without losing those aspects of the culture that have been valued over time. This is in line with Malcolm

X, when he once said, "Education is the passport to the future, for tomorrow belongs to those who prepare for it today" (n.d.). There is a growing awareness that teaching and learning will fully be digitalized, and networked in a knowledge-based society. Also, teaching and learning will be drastically different from today's learning (Punie & Ala-Mutka, 2007). Hence, the education system must

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respond to the changing needs of students and their teachers (Brar, 2017). Technological advancements are constantly reshaping the education industry or system, just like many other sectors. It has brought new possibilities that aim to save costs. Education has gone electronic, as electronic learning portals are in vogue in many educational institutions worldwide, and at the same time eliminating the need for making teachers/instructors present in every classroom, and duplicating efforts.

Kannadhasan, Shanmuganantham, Nagarajan and Deepa (2020) noted that presently, almost all institutions of higher education deliver programmes that incorporate digital media into an online environment to provide versatile learning opportunities, regardless of time and location". Technological innovations (e.g., e-learning portals) have made it possible to have a countless number of students in a technology class (TechClass). Web-based education has also made it possible for students/learners, wherever they are to register for courses, input their personal data/information, create a personalized account, send to and receive messages from lecturers, download course materials, receive and submit assignments to instructors/lecturers, and finally take online course quizzes.

The idea behind futuristic education, or think of futuristic education, we have to borrow the words of Villa (n.d.) by answering the following questions.

1. What is the dream that we have for our students?
2. What are the desired goals or outcomes of education?
3. What are the skills, competencies, talents, attributes, and dispositions that our students are going to need to lead quality lives in the future?

After reflecting on the above questions for a moment, we can now fashion out the skills, competencies, talents, and attributes that you identified to shape the type of future education we have future for our children.

Mampane (2022) declared thus: "Futuristic pedagogy advocates for the acquisition of systematized knowledge and skills and encourages the idea of engaging analytical and practical skills during learning". Secondly, futuristic education is a type of learning that aims to provide educational opportunities to a large section of students, who will study independently most of the time. As Villa (n.d.) further avowed, the futuristic education is a type of learning that will attempt to reach out to students, who span the spectrum of learning readiness, have

greater diversity within our schools in terms of culture, language, and perception of ability, gifts, and talents than we did at the start of the last century.

Meaning/Definitions of Conceptual Terms

Before delving into the nitty-gritty of this work, it will be necessary to understand the conceptual meaning of definitions of major terms that will help to comprehend the subject matter. Let us examine some of the salient ones hereunder.

E-learning: This is short for electronic learning. It is also known as web-based learning, online learning, and internet-based learning which uses internet technology to deliver multiple and diverse learning modalities to improve learner knowledge and performance (Rosenberg 2001, Wentling, Waight, Gallaher, La Fleur, Wang, Kanfer, 2000 and Cook, Garside, Levinson, Dupras, & Montori, 2010). Kannadhasan *et al.*, (2020) further characterized electronic learning as "the use of information and communication technology in various educational processes to support and enhance learning in higher education institutions, which includes the use of information and communication technology as a complement to traditional classrooms, online learning or a combination of the two Modes".

E-learning, according to Kannadhasan *et al.*, (2020), is broadly synonymous with, digital learning, technology-enhanced learning (TEL), computer-based instruction (CBI), and computer-managed instruction (CMI) as the primary components, and stresses the use of interactive media, and resources, such as forums, wikis, podcasts, and second-life virtual worlds. Similarly, (Eze *et al.*, 2018; Abdulhamid, Shafiu, and Murtala., 2017; Arghya. Pradip, and Shilpee *et al.*, 2020) have defined e-learning as computer-based (e.g., digital videos, tablets, projector, operating systems) learning process, which links digital content, system-based administrations, and mentoring support and aid in the interaction of students and teachers.

Future Skills: According to Ehlers (2020), future skills are defined as competencies that allow individuals to be (successfully) self-organized and capable of acting in highly emergent organizational and practical contexts; they are understood as behavioural dispositions that will manifest in complex and unknown future action situations as (successful) behaviour. As further expressed by Ehlers (2020), future skills also refer to competencies, hence, these are skills people will need in the future to shape their world and environment as citizens in an increasingly globalized context. According to Ehlers (2020), they are the skills that will be used to change higher education to

cope with the constant development and constant adaptation to new situations in organizations and working life. They are the skills that will enable university graduates to master the challenges of the future in the best possible way. They are skills that students must develop to deal with future challenges, such as curiosity, imagination, vision, resilience, and self-confidence, as well as the ability to act in a self-organized way (Ehlers, 2020).

The scholar further stated that future skills for students demand that students must be able to understand and respect the ideas, perspectives, and values of others, and they must be able to deal with mistakes and regressions, while at the same time progressing with care, even against difficulties. Additionally, Ehlers (2020) avowed that students must also strive to raise awareness for local and global challenges; to raise awareness and become mindful of how climate change impacts nature and the environment. Ehlers (2020) added and emphasized that Promoting Future Skills means “to strive for creating an educational system that enables future citizens to deal with the challenges involved and to care for greater coherence in society, to value openness, tolerance and an awareness of differences and diversity, and not to succumb to populist explanations”.

Future skills are major keys needed to change higher education to cope with the constant development and constant adaptation to new situations in organizations and working life. It comprises creativity, self-organization-abilities, self-reflection competence, or design. As Ehlers (2020) put it, thinking competence, however, requires ingenious forms of learning, teaching, and development. The integration of Information and Communication Technologies (ICT) will seriously play a key role in the envisaged futuristic education, where the skills to search, evaluate, manage, and use information and digital resources will be very essential for working and learning in the digital environment. In totality, futuristic skills are aimed at the development of personalities and strengthening professionalism (Ehlers, 2020). Futuristic learning skills require higher-order skills, that is, the “21st Century Skills”, popularly called the “4C’s”, which are “Creativity”, “Critical thinking”, “Communication”, and “Collaboration”, are essential for absorbing knowledge as well as for work performance.

Knowledge-Based Economy: We often hear people say “buzz word”; the knowledge-based economy has become a buzz phrase in modern society. We are in a competitive society, and the world is going through a great transformation, and every country is trying to transform itself from a traditional economy to a knowledge-based economy.

Cerovic and Maradin (2022) believe that the modern economy is characterized by changes that are taking place faster and more dynamic than ever before in human history. Hence, knowledge has become the essential driver of economic growth and development. According to Cerovic & Maradin (2022), the main guiding principle of modern society is knowledge, and the modern economy is knowledge-based. In today’s world, special attention is given to “know-how knowledge” that gets deeper meaning in the application of knowledge, innovations, high technologies, and the linking of universities and research centers with the private sector.

The phrase “Knowledge economy” was first founded in 1962 by an economist, Firtz Machlup (Mnju & Anand, 2020). Since then, the concept of a knowledge economy has become increasingly important as it leads to economic growth and competitiveness in overall economic sectors. It is a situation where intellectual capabilities become more important than physical inputs. The Knowledge-Based economy is defined as - An economy, which has the ability of knowledge, production, dissemination, and uses; whereas knowledge is an important factor in wealth creation, growth, and employment and human capital is the driver of innovation, creativity, and generation of new ideas, with the dependence and interconnection of information and communication technology (ICT) (Mnju & Anand, 2020).

Drucker (1994) asserted that a knowledge society is based on the creation, sharing, and application of knowledge for a well-functioning of society. In this case, knowledge is regarded as an important factor of production along with other factors, such as land, labour, and capital. Powell, & Snellman, K. (2004), opined that the knowledge economy is a bundle of intensive activities that speed up the pace of technical and scientific advancement. In totality, a knowledge-based economy means that technical and scientific advancement will form the basis for sustainable growth of the economy and the development and welfare of society.

Technology-Related Teaching Skills: Technology-related teaching skills, according to Digital Campus of Bavaria Research Group (2017) include a knowledge base for technology use in classrooms as well as skills to engage in planning, implementing, evaluating, and sharing technology-related teaching scenarios. These technology-related teaching skills of teachers are supposed to be the core drivers of orchestrating lessons employing several types of learning activities in effective and efficient sequences.

Digital Competence: Digital competence as cited in the work of Punie and Ala-Mutka (2007), involves the confident and critical use of Information Society Technology (IST) for work, leisure, and communication. It involves basic skills in ICT, such as the use of computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet (COM 2005/548). It is learning to use Information and Communication Technology tools. It has further been defined as possessing the necessary skills to participate in these future learning spaces (Punie and Ala-Mutka, 2007). Therefore, higher-order skills are needed to facilitate participation in all aspects of learning activities. It embraces essential skills to search, evaluate, manage, and use the information and digital resources for working and learning in the digital environment, which includes the skills to organize knowledge according to one's personal preferences and the means to build systems to follow and obtain updates on the relevant information as needed (Punie and Ala-Mutka, 2007). COM 2005/548) emphasized that digital competencies are the key competency for lifelong learning, which encompasses personal development, active citizenship, social inclusion, and the employment of all individuals. Digital competence includes skills to organize knowledge according to one's personal preferences and the means to build systems to follow and obtain updates on the relevant information as needed (Punie & Ala-Mutka, 2007).

Digital Technologies: These are computer-based technologies that present domain-general and domain-specific content and/or allow for interaction with or about the content and support teachers and/or students during that interaction (Stegmann, 2020). This includes the use of computers for presentation purposes, as well as computer-supported collaborative learning systems. According to Fraillon *et al.*, (2014), this broad definition includes the use of computers for presentation purposes, as well as computer-supported collaborative learning systems.

Futuristic Education/Learning: Mampane (2020) opined that futuristic pedagogy advocates the acquisition of systematized knowledge and skills and encourages the idea of engaging analytical and practical skills during learning. The new curriculum strongly advocates a phenomenon-based approach to learning across disciplines and emphasizes learner-centered and inquiry-based approaches, technology-enhanced learning, student autonomy, and developing schools as learning communities with distributed leadership (Ministry of Education, 2014). At its best, according to Arvaja, Sarja, Niemi, & Pakkanen (2020), an e-learning

instructional strategy enables a deeper investigation into areas of personal interest beyond what the whole class is learning.

Educational Technology: Educational Technology could be defined as the systematic application of the knowledge of sciences to practical tasks in Education. It is a communication process resulting from the adaptation of the scientific method to the behavioral science of teaching/learning. It is also defined as the combined use of computer hardware, software, and educational theory and practice to facilitate learning. It creates, uses, and manages technological processes and educational resources to help improve user academic performance. Educational technology is the considered implementation of appropriate tools, techniques, or processes that facilitate the application of senses, memory, and cognition to enhance teaching practices and improve learning outcomes. It is defined as "the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources" (Gani, Devi, Goundar, Reddy & Saber (2019).

Digital Learning: Digital learning is any type of learning that is accompanied by technology or by instructional practice that makes effective use of technology. It encompasses the application of a wide spectrum of practices, including blended and virtual learning. Digital learning is sometimes confused with online learning or e-learning; digital learning encompasses the aforementioned concept (https://en.wikipedia.org/wiki/Digital_learning#:~:text=Digital%20learning%20is%20any%20type,includin%20blended%20and%20virtual%20learning.).

Learning Environment: The expression or the phrase, "learning environment", refers to the way a classroom environment is organized. It as well refers to a space in which students feel safe and supported in their pursuit of knowledge, as well as inspired by their surroundings. However, a learning environment is more than just a classroom setup; a school environment refers to the set of relationships that occur among members of a school community that is determined by structural, personal, and functional factors of the educational institution, which provide distinctiveness to schools. Learning environments can be traditional, virtual, or a combination of both the traditional and the virtual. For instance, there are three categories of learning environments, such as face-to-face, online, and hybrid. The hybrid environment is a combination of both face-to-face and online environments. According to Baticulon, Alberto, Baron, Mabulay,

Rizada, Tiu, Clarion & Reyes (2021) and Zhao, Hwang & Shih (2021), in on-campus courses, the primary locus of the learning environment is a shared physical space at the university, which provides equal opportunities for participation to students independently of their residential situation. In contrast, courses that are primarily conducted online move the main locus of learning to a physical setting which is different for each participant.

Flexible Learning: Santiago, Ulanday, Centeno, Bayla, & Callanta (2021) defined flexible learning as a student-centered approach that provides students with a choice in what they learn, how they learn, and when and where they learn. Flexible learning is a combination of digital and non-digital technology that ensures the continuity of inclusive and accessible education in the form of online, offline, or blended modes of teaching and learning processes (https://www.google.com/search?q=Flexible+Learning+pdf+2019-2023&rlz=1C1RLNS_enNG1042NG1042&oq=Flexible+Learning+pdf+2019-2023&aqs=chrome..69i57j0i546l5.13295j0j15&sourceid=chrome&ie=UTF-8)

Digital Technology: Stegmann (2020) conceptualized digital technologies as computer-based technologies that present domain-general and domain-specific content and/or allow for interaction with or about the content and support teachers and/or students during that interaction.

Empowering Students for Futuristic Education

There is no doubt that the higher education landscape has changed remarkably since the introduction of technologies in the 21st century, thereby changing the ways teaching and learning are delivered in educational institutions that realigned most curricula. Futuristic education cannot be successful if the students are not technologically empowered to face the challenge of a knowledge-based society. Ehlers (2020) expressed concerns about how young people can be empowered to participate in social systems and processes, and how we can strengthen justice, peace, and the integrity of creation and community as values in a future society. Thus, the scholar emphasized that digital technologies will determine the relevance of our higher education Institutions in the future. Noting the relevance of future ICT-enabled learning, Punie and Ala-Mutka (2007) stressed that this requires digital competence from all participants involved in learning. The scholars' stressed that competence, in this case, includes both basic tool usage skills and higher-order skills for their efficient, critical, and innovative application in the teaching-learning process.

Nature and Basic digital skills for Futuristic Education

As Blessinger (2018) put it, the increasing demand for improved higher education suggests that as nations become more globalized and democratized, more people will participate in higher education of all types to equip themselves with the knowledge and skills needed to better function and compete in an increasingly globalized and complex world. E-learning is the best education system that best suits the above scenario. The activity-based learning approach will be the bases for learning. According to Goodwin (2018), futuristic education stresses the role of interaction and learning as participating and "doing" that requires an active role from the participant; a learner meeting the meaningful activity constructed by the interaction of cognition and embodiments with participants and artifacts. OECD (2015) defined "basic digital skills" as a set of individuals' abilities to effectively and responsibly participate in economic, social, and cultural life via digital technologies. In a futuristic education/learning, a variety of basic digital skills are necessary to effectively perform digital activities.

Based on this, the understanding of computer use, gathering information, producing information, and digital communication reflect central digital skills for futuristic teaching-learning activities (Fraillon *et al.*, 2014). The participants involved should be able to understand computer use, which necessarily refers to the basic knowledge and skills to process information through the use of digital technologies.

Again, the players must be involved in gathering information, as well refers to searching, accessing, evaluating, and managing information. Digital Campus of Bavaria research group (2017), Fraillon *et al.*, (2014), and KMK, (2016) further stated that both the teacher and the learner should be able to produce information with digital technologies, which invokes the transformation and creation of new products that may build upon existing ones. Communication is one of the vital components of skills, which plays a very important role in information exchange through digital technologies. These basic digital skills and competencies are fundamental to teachers' interactive learning activities and the frequency of digital technology use during teaching (Sailer, Murbock, Fischer, 2021).

Futuristic education is a type of education that will take many forms and also be based on technological devices; it is a type of education that will be internationalized and cause growing cooperation and rivalry between countries and

institutional providers; it is an education that will incorporate learning courses and degrees, online classes, professorship exchanges, joint research, collaborative research projects, and student exchanges (Kannadhasan *et al.*, 2020). Niemi (2020) affirmed that the role of education and training institutions will change significantly, with the emergence of lifelong and life-wide learning as the central learning paradigm for the future. It is a form of education where traditional education and training institutions will reposition themselves in the emerging learning landscape of the future.

It is a form of education that tends to be more affordable, with a wide range of payment options, which let you pay in installments or per class, cost-effective, and again, enables learners to save money from the commute and class materials, which are often available for free (Niemi, 2021). The scholar further asserts that schools will be redesigned, it will be a form of education where traditional walled-in classrooms and rows of desks will be replaced with more flexible, multipurpose, informal, and transformative open-plan designs. It will incorporate open and flexible designs and principles, at least to some extent (Niemi, 2021). As the Ministry of Education (2014) rightly started, it will be an education system that will strongly advocate a phenomenon-based approach to learning across disciplines and emphasizes learner-centered and inquiry-based approaches, technology-enhanced learning, student autonomy, and developing schools as learning communities with distributed leadership.

Emphasizing on nature of futuristic education, Redecker, Leis, Leendertse, Punie, Gijssbers, Kirschner, Stoyanov, and Hoogveld (2011) stated thus: "Learning will become more active, focusing on learning by doing, experiencing, touching. At the same time, it will become more social and collaborative with each learner constructing his/her knowledge in interaction with others in the context of practical applications and tasks. Student-centered learning approaches, where each learner's individual needs and progress are taken into account, will come to the fore. The traditional roles of teachers and students will change to support this development, and teachers will become moderators and guides for students' personalized and collaborative knowledge creation". P.31. Yet again, the overall vision and core of learning will be focused on operationalization rationalization, collaboration, and in formalization (informal learning), and will be the central guiding principle for organizing learning and teaching in the future (Redecker *et al.*, 2011).

Futuristic education will be synonymous with synchronous learning, where most of the

teaching-learning will be digitized (online). As declared by Redecker *et al.*, (2011), the central learning paradigm will be characterized by lifelong and life-wide learning and shaped by the ubiquity of Information and Communication Technologies (ICT). The scholar further stated that lifelong Learning will become even more important in the future. Futuristic education will make citizens become lifelong learners, who will flexibly respond to change and will proactively develop their competencies, and thrive in collaborative learning and working environments (Redecker *et al.*, 2011). Futuristic education will employ different learning styles that will accommodate all learners from different groups and backgrounds; the learning must be open, flexible, and allow for the integration of different learning sources and resources, different learning communities, and interactions (Redecker *et al.*, 2011).

Scholars have advocated that online learning (e-learning or distance learning) will be the future of education. They also assert that the constructivist method of learning where advanced skills of comprehension, reading, composition, and experimentation are acquired not through the transmission of facts but through the learner's interaction with the content will be the future method of instruction (Means, 1994). Constructivism takes advantage of the student's natural inclination to learn through experience and to create mental structures...which organize and synthesize the information and experience, that the individual encounters in the world. The futuristic education will be in fulfillment to Comenius, the founder of Charles University in Europe, who had a vision about education, which he said should be available, not just to one man or a few or even to many men, but to all people together as well as to each separately, young and old, rich and poor, irrespective of birth, men, and women, in short, everyone whose fate it is to have been born a human being (Villa, 2000).

Futurist education/learning will be based on a hands-on mode of instruction, where working on projects and problems will be of intrinsic interest to the learner or a group of learners, rather than learning what everyone else of the same age is expected to learn at the time; students will learn when they are ready and motivated to learn it, and probably when needed to solve a particular problem or complete project, or perhaps just from developmental readiness, or curiosity, or social pressure -rather than in a preset curriculum sequence. Learning will be continual and interdisciplinary in context; working on a project in depth, rather than covering many topics superficially (Villa, 2000). Means (1994), among

other researchers, have also claimed that learning will be as stated below:

- Working directly with people from other places and cultures, rather than only indirectly through books.
- Learning through teamwork
- Producing something of real value to someone
- Using the real tools for intellectual work that are used in the workplace, rather than oversimplified
- textbook techniques.
- Basing assessment of student progress on the performance of real tasks, rather than artificial tests.

However, basic digital skills can be defined as a set of individual abilities to effectively and responsibly participate in economic, social, and cultural life via digital technologies (OECD, 2015). According to ICILS 2013 framework, understanding the use of a computer, gathering information, producing information, and digital communication reflect central digital skills (Fraillon Ainley, Schulz & Friedman, 2014). According to Institute for Prospective Technological Studies (IPTS) (2011), basic digital skills for futuristic education will involve three major skills, such as,

1. Personal Skills: This involves initiative, resilience, responsibility, risk-taking, and creativity.
2. Social Skills: This will also involve team, networking, empathy, compassion, and co-constructing.
3. Learning Skills: This comprises managing, organizing, and meta-cognitive skills.

According to the report, the new ways of learning will embrace the following: –

1. Learner-centered: This will involve tailor-made, targeted, active, constructive, motivating, and engaging.
2. Social learning: This embraces peer learning, sharing, and collaboration in communities.
3. Lifelong learning: This will involve studying anywhere, anytime, via blending, virtual, and real combining sources and procedures.

Looking at the IPTS reports above, one will rightly declare that constructivist engagement and connectivist theories will come to play in futuristic education. Additionally, it also means that learning will be highly personalized, collaborative, and informative. Future learning will be hybrid, democratized, and phenomenon-based learning will play a better part. As Niemi (2021) explained, in phenomenon-based learning, themes, such as real-world issues can be approached from different

angles and subjects, not attempting to replace the teaching of subjects but to cross subject boundaries. This is seen as a response to the critique that traditional school involves too much theoretical and fragmented learning, instead of focusing on real-world issues, problems, and skills. According to Arvaja, Sarja, Niemi, & Pakkanen (2020) and the Ministry of Education (2014), at its best, the approach enables a deeper investigation into areas of personal interests beyond what the whole class is learning.

The Economist Intelligence Unit Limited 2015, sees problem-solving, team-working, and communication as the skills that are currently most in demand in the workplace. Similarly, Sean Rush, president and chief executive officer of JA (Junior Achievement) Worldwide, an organization that helps teach entrepreneurship in schools and links students with local business people, notes: “Communication and collaboration are essential in a list of 21st-century skills; so much of work in the future will require things to be done across boundaries”. These reports show that futuristic education will not be of many physical activities, but online.

Furthermore, as affirmed by Carvalho, Nicholson, Yeoman, & Thibaut (2020), OECD (2017) and Wells, Jackson & Benade (2018), futuristic education or learning will also have links with the focus on the supposed twenty-first-century learning skills, such as critical thinking, problem-solving, collaboration, creativity, leadership and the influx of digital technologies. Generally, Brar (2017) summarized futuristic education thus: -

- Future education will be exceptional.
- The role of education in the future will be dynamic.
- The focus will be on technical and professional education.
- Barriers to integrated education will be removed.
- Education will be based on social requirements.
- Present flaws of our school education system will be overcome.
- A different kind of student will emerge in the future.

The futuristic education as proposed by Brar (2017) will be such that will be based on environmentally focused direct-experience learning, taught within an educational environment with the concepts of creativity, cooperation, and consciousness development; effective communications and digital fluency competency at all educational levels will take preeminence. Technology-related subjects, such as computer

literacy, distance learning, digital photography and videography, media presentations, website design construction, and the fundamentals of electronics. High-tech should be craftily combined with high-touch, where learners will gain hands-on, project-centered learning. In this case, students/learners will be exposed to practical live experiences, and where innovative approaches to learning should be emphasized.

Additionally, a futuristic type of education is where students will imbibe a sense of community, creative thinking, problem-solving skills, and a high priority of self-reliance as a cornerstone of learning (Brar, 2017). It involves continuous progress to higher levels of critical and creative thinking in a collaborative environment of academic freedom; it encourages classroom engagement and learning to students to use modern and advanced approaches to teaching and learning. The skills acquired should facilitate students' intellectual, social, and emotional development. Futuristic pedagogy advocates the acquisition of systematized knowledge and skills and encourages the idea of engaging analytical and practical skills during learning (Mampane, 2020),

Futuristic learning necessitates that virtual schools will replace traditional educational institutions; most school buildings will changeover to learning centers that will accommodate both young stars and adult learners, and such centers will be open 24 hours a day; learners would decide on whatever instruction and courses they want online, and teachers and students can live anywhere and only meet online. Conclusively, teachers will become event planners, guides, and coaches and some who are entrepreneurial-minded may choose to become full-time course producers, and as a strong economy depends on our educational system, the future education will continue to change to provide a quality workforce to sustain the current and future knowledge-based economy (Otara, 2012).

Challenges/Problems of Futuristic Education

Key challenges for future learning as proposed by Punie & Ala-Mutka (2007) are both the need for new digital skills and the provision of new ways for learning and maintaining them. There is no doubt that future learning/education requires a great deal of the use of communication technology-enabled learning digital tools, competence, and higher-order skills from all participants involved in the learning process (Punie & Ala-Mutka, 2007), which will enable the efficient, critical and innovative application. As Punie & Ala-Mutka (2007) further put it, "The widespread diffusion of Information and Communication Technologies (ICT) together with other socio-economic and demographic changes give rise to new opportunities

for learning but also raise the need for acquiring new skills and competencies that are necessary for employment, education and training, self-development and participation in society".

Innovation creates both benefits and consequences. Contemporary Nigerian society, where we belong is full of challenges arising from underdevelopment. Currently, Nigeria, as a nation faces many problems in its education system, which ranges from infrastructural facilities decay from primary to higher educational institutions. The system is present finding it very difficult to cope with students' enrolments based on the existing facilities in the schools due to poor funding.

Though Brar (2017) stated that the future of education is uncertain, yet, scholar still agrees that one can predict it. The future of education can be predicted because the envisaged education will take some time to materialize in Nigeria due to constant poor budgetary allocation to education, which presently records the least in the African continent concerning the United Nations recommended yearly budgetary allocation to education. However, futuristic education in Nigeria, to be specific, will be confronted with the following challenges as will be outlined below.

1. **Resistance:** In Nigeria for instance, research has it that many digital immigrant teachers are usually resistant or unwilling to change the pedagogy, which they think has been working for them from time immemorial. They normally feel that the old ways of doing things are better than the modern type. Hence, they are resistant to any innovative ideas (Orijii, 2016).
2. **Electricity:** Digital education is synonymous with electricity. Future education cannot be effective without an adequate power supply. This is one of the problems bothering the Nigerian government; instead of improving on power supply, the country's power supply continues to deteriorate yearly. Hence, the schools, and the communities need to be provided with constant electricity for the citizens to cope with the demands of a digitized education system.
3. **Brain Drain:** Most brilliant scholars that had the opportunity have left the shores of Nigeria for a better future, thereby delaying the quick materialization of the envisaged future education due to poor remuneration and unhealthy welfare of both teaching and non-teaching staff. The scholars that will be behind the digitized
4. **Government Funding:** For decades, the Nigerian government has been very insensitive to budgetary allocation to the

- education sector. The paltry budgetary allocation has put the country's education sector in a mess, concerning global standards. However, hope is not lost that things may change shortly. In affirmation, Inadequate budgetary allocation has been identified by Birabil and Ogeh (2020). They affirmed that the underfunding of the education system is synonymous with the Nigerian government. Nigeria is one of the countries that is yet to allocate 26 percent of its budgetary allocation to education against the United Nations (UNESCO)'s recommendation. This has been one of the major problems bedeviling Nigerian education.
5. Corruption: Corruption is one of the diseases that will take a long to cure in Nigeria. It is on record that a snake swallows' money in Nigeria. This means that the little fund that is usually made for the purchase of some hardware and software to enhance digital learning is put into private pockets. This situation has seriously hampered the quick actualization of the digitalized education system in Nigeria.
 6. Leadership Preferences: Individual differences differ. Some leaders are technologically inclined while some are not; hence, this affects individuals' administrative styles. Some leaders are not technologically driven, hence, tend to slow down the pace of technological advancements, especially in the education sector. Leaders that are not innovative tend to slow down any innovative ideas.
 7. Lack of Technical Experts: It will not be an overstatement to state that lack of technical personnel has hampered most beautify plans to improve digitized education in Nigeria. Nigeria lacks technicians to handle some of the technological equipment available in schools. Due to a lack of knowledge, some of the technological tools rot away in schools.
 8. Technological Advancements. Otara (2012) opined that, continuous technological developments are creating additional challenges for education and society at large. They include the possibility for information overload with knowledge expected to increase fourfold and changes like knowledge and what we believe. Therefore, teachers and educational administrators, and/or policymakers must learn to deal with these rapidly accumulating innovations, such as laptop computers, interactive video technology, and robots with artificial intelligence.
 9. Infrastructure: Reviewed literature shows that some of the possible problems that face futuristic education in Nigeria include a lack of dependable infrastructural facilities, which also boils down to inadequate budgetary allocation (Birabil & Ogeh, 2020).
 10. Teachers' welfare: Teachers' welfare is yet one of the problems confronting the Nigerian education system. When the teachers are not motivated, it becomes very difficult for them to work to their maximum productivity. This is a technological age where the teachers are supposed to go for in-service training, yet, they are left to decide their faith. Nigerian teachers are poorly remunerated; therefore, they just work for working sake and wait for their reward in heaven. When the teachers are not technically trained, it becomes very difficult to cope with the futuristic digitized education.
 11. Irregular payment of teachers' salaries: For years, the Nigerian government has formed the habit of owing teachers. Some states in Nigeria do owe teachers' salaries between 6 months to 1 year. Even when the teachers want to develop themselves digitally in the absence of government support, they cannot afford the money. It will not also be a piece of surprising news that some states in Nigeria don't promote their teachers for over 10 years. A very good example is Rivers State. This situation affects the teachers' morale.
 12. Poor Network: Poor internet connectivity has been one of the problems in Nigeria's drive for a digitized education system as most of the communities in Nigeria are not connected.
 13. Interest: Another envisaged problem is poor students' interest in teacher education. Digitized education cannot function very well where the majority of the population is not interested in the teaching profession, especially as the Nigerian government looks down on the teaching profession. Reports have it that most students are not willing to venture into the teaching profession. Their orientation, interest, and values toward a teaching career are not encouraging. According to Birabil and Ogeh (2020), sometimes students come to study education-related courses when they could not get admission in their preferred discipline, and out of frustration, they become teachers. Then, what does society expect from such teachers?

Solutions to Challenges of Futuristic Education in Nigeria

If education is tailored to the social and economic realities of the society, then, futuristic education in Nigeria demands a lot from all concerned in the education industry. Hence, the following recommendation is made to curb the current and future challenges against the effective implementation of futuristic education in Nigeria.

1. **Electricity:** There should be a regular electricity supply, which is in tandem with digital education. Electricity should be provided to remote areas of the country because digitized education is inclusive and not limited to those in the cities.
2. **Fund:** Government should allocate more funds in line with the UNESCO recommendations that 26% of the total budget be allocated to the education sector. Hence, there should be regular grants to the state by the federal government for payment of teachers' salaries and the provision of adequate soft and hardware components necessary for the implementation of digital education.
3. **Teachers' Training:** Teachers should be sent on in-service training, workshop, seminars, and refresher courses to update their technical knowledge or skills. They should be trained in the use of instructional tools, such as Interactive whiteboards, and virtual reality. headsets, 3d printing, and podcasts to cope with futuristic education.
4. **Collaborate and Team-teaching:** Niemi (2021) stressed that "the new curriculum framework and new open and flexible spaces require and challenge teachers to collaborate more in developing phenomenon-based learning projects, modules across disciplines, engage in team planning and team teaching, and share responsibilities and to cultivate competencies in supporting students' setting of learning goals and more individualized learning projects".
5. **Network:** Futuristic education solely depends on internet connectivity. Hence, Nigeria should, as a matter of urgency properly and massively network her environments, especially those that live in remote areas for effective implementation of futuristic education.
6. **Corruption:** The issue of corruption must be seriously tackled by the Nigerian government as the meager funds provided are usually misappropriated by individuals entrusted with such responsibility of managing the money. Therefore, proper punishments should be placed for offenders

so that the money made available for the purchase of some hardware and software to enhance digital learning will be properly utilized.

7. **Interest:** No matter how good a curriculum may be, if there are no teachers to implement it, it becomes useless. As a result, the government should sensitize the public to liken the teaching profession by enhancing their salaries, promoting them when due, and providing in-service training programmes via study leaves, workshops, seminars, conferences, etc. If the teachers' salaries and their total welfare are taken into consideration by the Nigerian government, this process will motivate individuals to see the teaching profession as a lucrative profession, and will they be interested to belong.
8. **Infrastructure:** Digitized education system demands lots of technological devices for its operation, and these facilities are not less expensive. Government should heavily invest in technical devices that are required to facilitate the implementation of the said envisaged education system.
9. **Bandwidth:** Nigerian government, as a matter of necessity should endeavour to provide adequate bandwidth to enable both staff and students and the general public to participate in the new education system.

Technologies of Futuristic Education

The Covid-19 pandemic that devastated the whole world has further emphasized the crucial role of technology in our daily lives, especially for teaching and learning in schools and at various homes (Seufert, Guggemos, & Sailer, 2021), directing us to the future education of our children, which schools will play a major role in preparing students for the challenges of using technology consciously and responsibly. Castillo-Manzano, Castro-Nuño, Lopez-Valpuesta, Sanz-Díaz and Yñiguez (2016), Janssen and Bodemer (2013) observed that technology will not only open doors for social inclusion in modern societies, it will also offer diverse opportunities for both students and educators to support teaching and learning processes.

We have an abundance of digital technologies that surround teaching and learning practice. Most of these technologies came to play during the COVID pandemic. Most of these technology tools/platforms are listed below as identified by Olaitan (2020). They are: -

- (1). GoToMeeting.com
- (2). Skype.com
- (3). Google Classroom
- (4). Blackboard.com
- (5). Edx.org
- (6). Youtube.com
- (7). Udemy.com
- (8). Courser.org

Memory.com (9). Open Online Education (edu.google.com) (10). Khanacademy.org (11). Easyclass.com (12). Vedamo.com (13). Alison.com (14). TED-Ed (ed.ted.com) (15). Codeacademy.com (16). Stanford Online (Online.stanford.edu) (17). Futurelearn.com (18). Rcampus.com (19). Learnopia.com (20). Peer 2 Peer University (p2pu.org) (21). Teachers Pay Teachers (teacherspayteachers.com) (23). Thinkific (thinkific.com) (24). MOOC.org (25). Openculture.com (26). Academicearth.org (27). iTunes Free Courses (apps.apple.com) (28) lessonpaths.com (29). memrise.com (30) funbrain.com (for kids) (31). whyville.net (for teens) (32). edmodo (edmodo.com) (33). Schoology (schoology.com) (34) class dojo (classdojo.com) (35). google handouts (hangouts.google.com) (26) zoom (zoom.us) and (37). Whatsapp.com (Olaitan, 2020).

This means that teachers and schools must take the advantages inherent in digital technologies in classrooms. In anticipation of a successful implementation of digital learning in schools, governments around the world have arranged considerable investments in digital technology in schools (Kearney, Schuck, Aubusson & Burke, 2018). Of all these innovations, computers seem to be the most powerful of these technological advancements in our present societies. Because there are expectations that investments in digital technologies, particularly computers, could result in improved learning achievements in the academic circle, most teachers do not yet have satisfactory skills to make the most out of digital technologies in schools (OECD, 2015, 2017).

Presently, the use of technology has formed most aspects of our daily lives (Fraillon al, 2014); so, we expect teachers' technology usage in classrooms to be at an advanced level; yet in comparison to the use of digital technology in our daily lives, teaching and learning with digital technologies have not been so all-encompassing in teacher education and schools as noticed by Sailer, Murbock & Fischer (2021). Sailer, Murbock and Fischer (2021) further stressed that teachers are not yet succeeding in fostering students' constructive and interactive learning activities involving digital technologies. Based on the above assertion, the scholars queried how often teachers use digital technologies and the types of student learning activities teachers foster with digital technology in the classroom. Mishra & Koehler (2006) stated that for successful teaching with technology in the classroom, besides teachers' basic digital skills, they also need technological knowledge, technological-pedagogical knowledge, technological-content knowledge, and technological-pedagogical content knowledge.

Digital Campus of Bavaria Research Group (2017) and Sailer *et al.*, (2021) have recently emphasized the idea of teachers' problem-solving skills in different phases of teaching with technology, such as planning, implementing, evaluating, and sharing. There has been a great assumption that students who use computers moderately at school tend to have better learning outcomes than students who use computers rarely. Scholars also claim that technology-related teaching skills are relevant for fostering learning activities, in which students actively use digital technologies (Digital Campus of Bavaria research group, 2017). According to Sailer et al (2021, a recent study highlights that teachers' technology-related teaching skills show strong relationships with sophisticated students' learning activities involving digital technology. For teachers, emphasis is placed on three types of knowledge: content knowledge, pedagogical knowledge, and technological knowledge.

The emphasis here is that futuristic education depends on new technological advancements. Thus, teachers and students/learners, and the entire school administrative setup must be technologically compliant for a successful implementation of digital technology for the envisaged futuristic education. As a prerequisite, teachers need basic digital skills at their disposal to apply digital technology in the classroom and to foster their students' basic digital skills (KMK, 2016; Krumsvik, 2011).

However, ICT not only affects what people need to learn but also how they will learn. Due to the ubiquity of technology and its power to facilitate highly dynamic, adaptable, and engaging virtual learning environments, personalized lifelong learning opportunities will become feasible in the education of the future (Redecker, Leis, Leendertse, Punie, Gijsbers, Kirschner, Stoyanov, & Hoogveld (2011)).

The curriculum and school reforms also have links with a focus on twenty-first-century learning skills, such as critical thinking, problem solving, collaboration, creativity, and leadership (Binkley *et al.*, 2012; Carvalho, Nicholson, Yeoman, & Thibaut, 2020; OECD 2017; Wells, Jackson, & Benade, 2018) and the influx of digital technologies. The remodeling of school and classroom spaces away from deskbound whole-class instruction settings towards spaces allowing flexible and versatile use of groupings and instructional formats is seen among the factors facilitating the achievement of the aims of the new curriculum and twenty-first-century learning skills (Benade, 2015).

As Gislason (2015), Saltmarsh, Chapman, Campbell and Drew (2014), Woolner (2010), and Yeoman and Wilson (2019) observed, futuristic education/learning will introduce a more open and flexible school design that will consider challenge not only the conventional organization of space but also pre-defined structures, routines, and interaction practices. It will further involve open and flexible learning environments that will involve multiple classes, multiple teachers, and technology-enhanced common spaces without designated desks for students or teachers' podiums (Benade, 2016; Cardellino & Woolner, 2019; Imms & Byers, 2017); it will allow for flexible grouping for different learning activities and group sizes. It will make a change from the physically known bounded classrooms to online flexible spaces (Wood, 2018).

Features of Futuristic Education

The pattern of educating our children is constantly changing daily. Consequently, as Baweja (2021) put it, "A parent must understand this educational approach for the better future of their child. Below are the major features of futuristic education as outlined by the scholar".

Skill-based Learning Process: The teachers teach the students with skill-based techniques. They make the students perform "hands-on" experiments that easily gain knowledge. Therefore, practical approaches are considered more effective than theoretical ones for conceptual learning. Hence, the students get their skill set enhanced by becoming more productive.

Learning with Fun: The futuristic education, the students' study while having fun. This they gain through learning with digital videos, exercises, and even games. The video sessions provided by the teachers are useful for the students. Therefore, studies go in hand with technological advancements. They complete their tasks on time and make learning their hobby.

Flexible Learning Patterns: Each student has his individuality and understanding. As a result, teachers adopt flexible approaches to teaching-learning, so that the students learn and memorize the concepts at their own pace.

Measurement of Student Performance: The futuristic approach focuses on the development of the child. Therefore, teachers try to maintain a record of performance for each child. And with this, they make the child improve and prepare them to compete at the global level with their peers.

Teachers Focus on Student Preferences: The future of education focuses on the student's

strengths. Hence, the teachers give freedom to students to choose and choose their choice of subjects. The teachers follow a centralized approach to teaching that will provide benefits to the students at higher levels.

Distance Education: In futuristic learning, the education of children will be at a distance as opposed to physical presence. Distance education is defined as any type of learning experience in which the learner and the teacher are separated physically (not only by location but also by time) (Santiago, Ulanday, Centeno, Bayla, Callanta, 2021). This flexibility allows students to take an active role in their education and aims to provide learning opportunities to all students, regardless of their circumstances (Joaquin *et al.*, 2020). Moreover, students' responsibility for their learning will define their own goal to learn more, and plan for creative learning (Yilmaz, 2018).

Students' Basic Futuristic Skills for Learning

As Considine, Horton & Moorman (2009) earlier emphasized, the abundance of digital technologies surrounding us today does not mean that we can use them effectively to our benefit. For students, according to Digital Campus of Bavaria, Research Group (2017) and KMK (2016), basic digital skills are the target skills to acquire for further development in schools. As a student, to effectively respond to the demands of future teaching-learning, there are some basic skills required. These skills may include students having ample opportunity to acquire and develop essential higher-order skills, such as critical thinking, collaboration, and perseverance. These skills, which can be integrated into the instruction process, reflect what employers want and need from their workforce in the future years (World Global Summit, 2018).

Teachers' Basic Skills for the Futuristic Education

One will not be in a haste to ask what types of teachers' skills are potentially relevant for the frequency of digital technology use during teaching and the types of student learning activities involving digital technology. Especially, the teachers' basic digital skills in terms of an "individual's ability to use computers to investigate, create, and communicate to participate effectively at home, at school, in the workplace, and society" (Fraillon *et al.*, 2014, p. 17).

The important role of teachers in futuristic education cannot be overemphasized. Futuristic advocates affirmed that technology will always be just one part of the learning equation, as OTA-commissioned papers and workshop participants suggested. The envisaged futuristic education will be

accord on personalized learning, which will require the guidance and support of teachers. Therefore, futuristic education is a situation in which the teachers will play the role of mentors and guidance counselors. They will be developing individual learning pathways and supporting and guiding students in their learning endeavours. As a precondition for futuristic education, and as noted by KMK (2016) and Krumsvik (2011), teachers need to have basic digital skills at their disposal to apply digital technology in the classroom, and to foster their students' basic digital skills.

In the same manner, Redecker *et al.*, (2011) assert that in future education, teachers will need to continuously update their skills to adapt to changing learning-teaching patterns and strategies. Redecker *et al.*, (2011) have also observed that futuristic education is such that people will continuously update their skills, professional careers will become more flexible and dynamic, and all citizens, no matter how highly qualified, will need to proactively design and promote their careers by seizing relevant training opportunities. This, therefore, means that futuristic education will be digitally inclined.

Hence, teachers' knowledge of technological tools and skills, and the knowledge of educational software and hardware becomes very relevant. According to U.S. Congress, the Office of Technology Assessment, 1995, declared that extensive use of technology in the classroom will typically change the teachers' roles. Some futurists have also entertained some fears about the possible elimination of teachers because of allowing students to use technology to interact directly and individually with content. In one way, teachers will collaborate and work in pairs or teams (Niemi, 2021). The scholar further stressed that "open spaces are likely to lead to changes in teaching practices towards more students working in small groups and one-to-one learning in contrast to frontal teaching because there is no distinct front, such as a teacher's desk or chalkboard to teach from" (Niemi, 2021).

The new curriculum strongly advocates a phenomenon-based approach to learning across disciplines and emphasizes learner-centered and inquiry-based approaches, and technology-enhanced distributed leadership (Ministry of Education, 2014). In phenomenon-based learning, themes such as real-world issues can be approached from different angles and subjects. The idea of phenomenon-based learning is not replacing the teaching of subjects, but to cross subject boundaries. Phenomenon-based learning has been seen as a response to the critique that traditional school involves too much theoretical and fragmented learning instead of focusing on real-

world issues, problems, and skills. At its best, the approach enables a deeper investigation into areas of personal interest beyond what the whole class is learning (Arvaja, Sarja, Niemi, & Pakkanen, 2020; Ministry of Education, 2014).

In futuristic education, teachers need to learn various technological devices, and also learn to design structure, guide, and assess progress in learning centered on student projects; again, inspiring, guiding, advising, and coaching students and imparting expertise (Niemi, 2021). There will be a new kind of interaction between teachers and students (Kozma & Grant, 2005).

Digital Technology in Schools

Ehlers (2020) observed that in addition to technology-related teaching skills, the availability of digital technologies in schools is potentially related to the use of technology and learning activities involving technologies. Futuristic education will involve all forms of educational technologies based on the course content. Therefore, schools as a matter of fact must possess these technologies which the futurist teachers will heavily rely upon to deliver their content. It as well becomes very clear that the absence of these technological devices in any school will invariably create emptiness in the education system, which will be counter-productive to the envisaged future education. To realize the true future of education, the school authorities, education stakeholders, and government at all levels of the education system must be up and doing to provide the necessary technological software and hardware necessary for education delivery to the citizens.

CONCLUSION

There is no doubt that the conventional method of education is no longer in conformity with the present realities, especially as it affects higher educational institutions. Presently, most traditional educational institutions, particularly in developing countries, of which Nigeria is not exclusive, are facing numerous challenges, which include, budget cuts, and the gap between theoretical and practical training that has made is indispensable for many educational institutions to look for alternative means of survival (Kannadhasan *et al.*, 2020). Given this, the use of technological devices is becoming integral to higher education in teaching and learning, not only in advanced countries but in developing nations of the world, thereby giving broader access to education and training to the disadvantaged children of the poor masses. Therefore, all higher educational institutions today need drastic reform to effectively respond to the envisaged inclusive digitalized education of the future.

The world is moving forward, technology is affecting every aspect of our life, and the education sector is generally being affected. The pattern of teaching-learning is being constantly altered, and the approaches chosen for education are becoming more thrilling, sensible, and productive. Future education is a situation where information can be easily gotten at the mouse click, and where the children will learn from their homes, where teachers will no longer be the oracle in front of the classroom, where the emphasis will be placed on the importance of group discussion, allowing students to work things out for themselves, while also learning how to respond to the different skills and opinions of their peers.

Therefore, if we, as Nigerians want to move forward beyond the present position, we must endeavour to seek new opportunities in the unknown world by leaving the present behind by changing our ways of educating and training our students; we must change our mindsets and remove our minds that are buried in tradition, customs and beliefs by breaking new grounds and endeavour to educate, develop and train our youngsters while focusing on delivering quality education and training that is rooted in new technologies, and appropriate investment made in the cultivation of talents, skills and knowledge that will be derived from the new reformed educational curriculum, where new ideas are created in laboratories to prepare active and creative participants, specifically equipped with job oriented competencies (creativity, problem-solving and critical thinking skills (MaCcrendle and Renton, 2018) that will transform the society for the knowledge-based economy.

Consequently, when we sum up all of the above, we see a new approach to teaching and learning that is known as futuristic education, where the teachers teach and students learn at the global level (Baweja, 2021).

REFERENCE

- Abdulhamid, T. H., Shafiu, M. T., Murtala, A. (2017). Perpetuation intention of using e-learning among universities students in Nigeria. *Int J Sci Technol Manag*, 6(5), pp. 28–41.
- Arghya, R, Pradip, K. B., & Shilpee A. D. (2020). *Psychological analytics based technology adoption model for effective educational marketing in digital and social media marketing, emerging applications and theoretical development*. Switzerland: Springer.
- Arvaja, M., Sarja, S., Niemi, K., & Pakkanen, M. (2020). Ilmiöpohjainen oppiminen valokeilassa Ymmärryksen rakentaminen ja refleksiivisyys yliopisto-opintojen alkuvaiheessa. *Kasvatus*, (1), 6–20.
- Asongu, S. A., & Kuada, J. (2020). Building knowledge economies in Africa: An introduction, AGDI Working Paper, No. WP/20/002, African Governance and Development Institute (AGDI), Yaoundé
- Baticulon, R., S. Y., J., Alberto, N., Baron, M., Mabulay, R., Rizada, L., Tiu, C., Clarion, C., & Reyes, J. (2021). Barriers to online learning in the time of covid-19: A national survey of medical students in the Philippines. *Medical Science Educator*, 31, 1–12.
- Baweja, C. (2021). Futuristic education - The new approach to learning. Retrieved 23 February, 2023 from <https://ezyschooling.com/parenting/expert/futuristic-education>.
- Benade, L., & Jackson, M. (Eds.), *Transforming education: Design, technology, government*. Singapore: Springer. Pp.95–106.
- Benade, L. (2015). Teachers' critical reflective practice in the context of twenty-first century learning. *Open Review of Educational Research*, 2(1), 42–54.
- Benade, L. (2016). Is the classroom obsolete in the twenty-first century? *Journal of Educational Philosophy and Theory*, 49, 796–807.
- Binkley, M., Erstad, O., Herman, J., Raizen, S., Ripley, M., Miller-Ricci, M., & Rumble, M. (2012). *Defining twenty-first century skills*. In *Assessment and teaching of 21st century skills*. Pp.17–66). Springer Netherlands.
- Birabil, S. T., & Ogeh, O. W. M. (2020). Education in Nigeria: challenges and way forward. *International Journal of Academic Research and Reflection*, 8(1), 42–48.
- Boisselle, L. N. (2014). Online-learning and its utility to higher education in the Anglophone Caribbean. *Sage Open*, 4(4), 1–14.
- Brar, S. K. (2017). Transforming education system: a futuristic perspective. *Globus: An International Journal of Management & IT A Refereed Research Journal*, January-June, 8(2), P. 21–23.
- Cardellino, P., & Woolner, P. (2019). Designing for transformation – A case study of open learning spaces and educational change. *Pedagogy, Culture & Society*, 1, pp. 1–20.
- Carnevale, A. P. (1994). *America and the new economy*. Washington, DC: The Program and Freedom Foundation.
- Carvalho, L., Nicholson, T., Yeoman, P., & Thibaut, P. (2020). Space matters: Framing the New Zealand learning landscape. *Learning Environments Research*. doi:10.1007/s10984-020-09311-4
- Castillo-Manzano, J. I., Castro-Nuño, M., López-Valpuesta, L., Sanz-Díaz, M. T., & Yñiguez, R. (2016). Measuring the effect of ARS

- on academic performance: A global meta-analysis. *Computers & Education*, 96, 109e121. <https://doi.org/10.1016/j.compedu.2016.02.007>
- Chauhan, A. (2021). Master slave architecture in hadoop. Retrieved 16 January from <https://blogs.msdn.microsoft.com/avkashchauhan/2012/02/24/master-slave-architecture-in-hadoop/>
 - COM. (2005). Proposal for a recommendation of the European parliament and of the council on key competences for lifelong learning, Brussels, 10.11.2005, P. 16. Retrieved http://europa.eu.int/comm/education/policies/2010/doc/keyrec_en.pdf
 - Cook, D. A., Garside, S., Levinson, A. J., Dupras, D. M., & Montori, V. M. (2010). What do we mean by web-based learning? A systematic review of the variability of interventions. *Med Educ.*, 44(8): Pp.765-774.
 - Digital Campus of Bavaria Research Group. (2017). Kernkompetenzen von Lehrkräften für das Unterrichten in einer digitalisierten Welt [Core competencies of teachers for teaching in a digital world]. *Merz Medien & Erziehung: Zeitschrift Für Medienpädagogik*, 4, 65e74.
 - Drucker, P. F. (1994). *Post-capitalist society*, Routledge.
 - Ehlers, U. (2020). *Future skills – future learning and future higher education*. German: Springer, 331p.
 - Eze, S. C., & Chinedu-Eze, C. V. (2018) Examining information and communication technology (ICT) adoption in SMEs: a dynamic capabilities approach. *J Enterprise Inform Manag*, 31(2), 38–356.
 - Eze, S. C., Chinedu-Eze, V., & Bello, A. O. (2018). The utilisation of e-learning facilities in the educational delivery system of Nigeria: a study of M-University. *Int J Educ Technol Higher Educ*, 15(34), 1–20. Available at <https://doi.org/10.1186/s41239-018-0116-z>
 - Fadel, C. (n.d.). What should students learn in the 21st century? Retrieved 5 March, 2023 from <https://oecd.edtoday.com/what-should-students-learn-in-the-21st-century/>
 - Flexible learning is a combination of digital and non-digital technology that ensures the continuity of inclusive and accessible education in the form of online, offline, or blended modes of teaching and learning processes.
 - Fraillon, J., Ainley, J., Schulz, W., & Friedman, T. (2014). Preparing for life in a digital age: The IEA international computer and information literacy study 2013 international report. Springer.
 - Gani, R., Devi, S., Goundar, S., Reddy, E., & Saber, F. (2019). Educational technology: relevance to a fujian classroom. open access peer-reviewed chapter. doi: 10.5772/intechopen.88875 retrieved 24 February, 2023 from <https://www.intechopen.com/chapters/68867>
 - Gislason, N. (2015). The open plan high school: Educational motivations and challenges. In
 - Goodwin, C. (2018). *Co-operative action*. New York: Cambridge University Press.
 - Imms, W., & Byers, T. (2017). Impact of classroom design on teacher pedagogy and student engagement and performance in mathematics. *Learning Environment Research*, 20, 139-152.
 - Kannadhasan, S. Shanmuganantham, M., Nagarajan, R., & Deepa, S. (2020). The role of future e-learning system and higher education. *International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)*, 12(2), 260-265.
 - KMK. (2016). Bildung in der digitalen Welt. Strategie der Kultusministerkonferenz. Education in a digital world. Strategy of the conference of federal ministers of Germany. Kultusministerkonferenz [conference of federal ministers]. Koehler, M., & Mishra, P. (2009). What is technological pedagogical.
 - Kozma, R., & Grant, W (2005). Using technology to build communities of understanding, OTA contractor report, November 1994, NTIS No. 95-172235.
 - Krumsvik, R. J. (2011). Digital competence in the Norwegian teacher education and schools. *Högskole Utbildning*, 1, 39e51.
 - Kultusministerkonferenz (KMK). (2015). Handreichung für die Erarbeitung von Rahmenlehrplänen der Kultusministerkonferenz für den berufsbezogenen Unterricht in der Berufsschule und ihre Abstimmung mit Ausbildungsordnungen des Bundes für anerkannte. Bonn.
 - MacCrendle, M., & Renton, S. (2018). The Future of Education: The education trends shaping Australia's future. Conference Paper. Available at: <https://www.researchgate.net/publication/335159813>
 - Mampane, S. T. (2020). Futuristic learning: Improving classroom engagement and learning in a distance higher education institution. In Sengupta, E., Blessinger, P. & Makhanya, M. (Ed.) *Improving Classroom Engagement and International Development Programs: International Perspectives on Humanizing Higher Education -Innovations in Higher Education Teaching and Learning, Vol. 27*. Bingley: Emerald Publishing Limited. Pp. 189-204. Available at <https://doi.org/10.1108/S2055-364120200000027015>
 - Means, B. (ed.). *Using technology to advance education goals: technology and education*

- Reform*. San Francisco, CA: Jossey-Bass Publishers.
- Ministry of Education. (2014). Finnish National Curriculum. National Board of Education. 11 October, 2022 from Retrieved from http://www.oph.fi/download/163777_perusopetuksen_opetusuunnitelman_perusteet_2014.pdf
 - Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A for teacher knowledge. *Teachers College Record*, 108(6), 1017.
 - Mnju, N., & Anand, C. (2020). Knowledge-based economic development: A comparative study of selected countries. *Journal of Critical Review*, 7(19), 2020, pp. 4142-6169.
 - Niemi, K. (2021). The best guess for the future? Teachers' adaptation to open and flexible learning environments in Finland. *Education Inquiry*, 12(3), 282-300. Available at <https://doi.org/10.1080/20004508.2020.1816371>
 - OECD. (2015). *Students, computers and learning. Making the connection*. OECD Publishing.
 - OECD. (2017). *PISA 2015 results, vol. V): Collaborative problem solving*. OECD Publishing.
 - OECD. (2017). *The OECD handbook for innovative learning environments*. Paris: Author.
 - Oriji, A., & Amadi, R. (2016). E-education: Changing the mindsets of resistant and saboteur teachers. *Journal of Education and Practice*, 7(16), 122-126.
 - Otara, A. (2012). The future of education and its challenges in Africa. *International Journal of Humanities and Social Science*, 2(9), 151-156.
 - Punie, Y., & Ala-Mutka, K. (2007). Future learning spaces: New ways of learning and new digital skills to learn. *Nordic Journal of Digital Literacy*, 2, 210-225.
 - Redecker, C., Leis, M., Leendertse, M., Punie, Y., Gijsbers, G., Kirschner, P., Stoyanov, S., & Hoogveld, B. (2011). *The future of learning: Preparing for change*. Luxembourg: Publications Office of the European Union
 - Rosenberg, M. (2001). *E-learning: strategies for delivering knowledge in the digital age*. New York, NY: McGraw-Hill; 344p.
 - Sailer, M., Murbock, J., Fischer, F. (2021). Digital learning in schools: What does it take beyond digital technology? *Teaching and Teacher Education*, 103(2021), 1-13.
 - Saltmarsh, S., Chapman, A., Campbell, M., & Drew, C. (2015). Putting "structure within the space": Spatially un/responsive pedagogic practices in open-plan learning environments. *Educational Review*, 67(3), Pp. 315-327.
 - Santiago, R., C., Ulanday, M. A. P., Centeno, Z. J. R., Bayla, M. C. D., Callanta, J. S. (2021).
 - Stegmann, K. (2020). Effekte digitalen lernens auf den wissens- und kompetenzerwerb in der schule: Eine integration metaanalytischer befunde effects of digital learning on knowledge and competence development in school: A integration of meta-analytic evidences. *Zeitschrift für Pädagogik*, 66(2), 174e190.
 - The Economist Intelligence Unit Limited. (2015). *Driving the skills agenda: Preparing students for the future: An Economist Intelligence Unit report*, sponsored by Google. London.
 - U.S. Congress, Office of Technology Assessment, *Teachers and Technology: Making the Connection*, OTA-EHR-616 (Washington, DC: U.S. Government Printing Office, April, 1995).
 - Wells, A., Jackson, M. & Benade, L. (2018). Modern learning environments: embodiment of a disjunctive encounter. In Benade, L. & Jackson, M. (Eds.), *Transforming education: Design, technology, government* (pp. 3-17). Singapore: Springer.
 - Wentling, T., Waight, C., Gallaher, J., La Fleur, J., Wang, C., Kanfer, A. (2000). *E-learning: A review of literature*. Urbana-Champaign, IL: University of Illinois; 2000.
 - Wood, A. (2018). Selling new learning spaces – Flexibly anything for the 21st century. In
 - Woolner, P. (Ed.). *School design together* (pp. 101-119). Abingdon: Routledge.
 - World Global Summit. (2018). *The future of technology education how governments can help close the 21st-century skills gap the Boston consulting group* February 2018.
 - Zhao, L., Hwang, W. Y., & Shih, T. K. (2021). Investigation of the physical learning environment of distance learning under COVID-19 and its influence on students' health and learning satisfaction. *International Journal of Distance Education Technologies*, 19(2), 77-98. Available at <https://doi.org/10.4018/IJDET.20210401.0a4>