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Implications of theories for online teaching and learning; an intervention to the effects of COVID-19 pandemic on Education in Ghana

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Abstract
The Global prevalence of COVID-19 notwithstanding the deficit of academic performance when comparing students with learning disabilities (LD) to their colleagues who are non-disabled has led all Ghanaian schools to halt teaching and learning at all levels in regular education classrooms from pre-school to the tertiary level. In this time of crisis whiles students prepare and await national examinations like Basic Education Certificate Examination(BECE) for basic schools, West African Secondary School Certificate Examination (WASSCE) for senior high schools and Ghana National Teacher Licensure Examination (GTLE) for prospective teachers; are there alternative ways for learning instead of the regular conventional face to face classroom interaction? Is Ghana ready and prepared for such alternative methods? Would students with learning disabilities be catered for to avoid high abysmal performances in these examinations? This study is aimed at discussing possible implications of online learning based on educational theories and teachers' personal theories of teaching and learning as interventions. The fundamental framework for this study was adapted from Fox's (1983) teaching as professed in teachers' theory of teaching and learning by Nicole (2017) as well as relating the behaviourists, developmentalists and constructivists learning theories to online teaching. Revealing the existence of knowledge as basis for this study, review of literature for online learning was discussed to support the relevancy and significance to the study. Recommendations for future research include examining effects of using online learning to enhance students' academic performance. This study would provide basic schools, secondary schools, colleges of education and their affiliated university teachers with the need to employ a blend of online platforms during and after schools lock-down for teaching and learning in Ghana.

Key Words: Coronavirus, COVID-19, Online Learning (OL), learning theories, Learning Disabilities (LD), Face to Face

1 Introduction
Global health organizations including World Health Organization (WHO), United Nations Children's Fund (UNICEF) and United Nations Educational Scientific and Cultural Organization (UNESCO) declared the prevalence of Corona Virus Disease (COVID-19) as a pandemic.The outbreak has wiped out most of the world's business, sporting, economic and educational activities.

This necessitated the president of the republic of Ghana on the 15th March, 2020 to instruct all educational institutions to close down with a ban put on all public gatherings until further notice. This has led to closure of borders, announcing travel advisory and ensuring WHO precautionary measures. Public universities in Ghana upon the president's directive issued out communiqué' instructing all students to vacate campuses and also recommending alternative ways of enhancing teaching and learning. The Ghana Education Service in collaboration with the Ghana Health Service took steps to curb the outbreak in schools especially for candidates preparing for their final examinations including BECE and WASCE. All classroom interactions including; clinical, practical, seminars, conferences and workshops were suspended including all national and international events slated to take place. Academia is advised to use technology to facilitate meetings and other activities as much as possible.

2 Learning needs of students in a regular Ghanaian classroom
In Ghana a significant number of students with or without learning disabilities (LD) receive their academic instruction in the regular face to face classroom due to the practice of inclusive education. According to individuals with Disabilities Act (IDEA, 2004), the spirit of IDEA is to provide students with LD an appropriate education in the least restrictive environment. According to IDEA, as stated in (Nicole, 2017)'s study teachers should address the goals and objectives of students especially ones with LD in the regular education classroom. However, in an attempt to comply with this legislation, some schools place students with LD in regular education classrooms where teachers lack the skills and expertise to address their instructional needs (Wadlington & Wadlington, 2008). Some students with LD receive instruction in regular face to face classes where there are limited or no accommodations directed towards their disability (Wadlington & Wadlington, 2008). When this occurs, students with LD may receive inadequate instruction in the regular education classroom, and their academic performance is lower than their non-disabled peers (Deshler et al., 2008). Failure to improve teaching and learning conditions in the regular face to face classroom for students with LD may have dire effects on their future success (Nicole, 2017 p.1).

According to Meyen and Greer (2010), teachers' instructional decisions have created an achievement gap between the academic performance of students with and without LD. To close the achievement gap between students with and without LD, regular educators must design and implement instruction that addresses the learning needs of all students in the regular face to face classroom. This expectation will require schools to focus on how and what students learn in regular education. This process will also include an examination of what intervention strategies and supports are in place to help all students achieve success equitably (Nicole, 2017 p.1).

3 Effect of COVID-19 on Education

The last few weeks of March, 2020 have witnessed heightened awareness of the threat from the outbreak of COVID-19 (coronavirus). As the virus spreads around the world, we also need to understand what it means for the education systems globally. With the need to contain the virus, many countries are implementing measures to reduce gatherings of large crowds. Our schools are not immune to these actions, or to the spread of the virus. Many countries have now implemented measures in their education systems – from banning gatherings to the temporary closing of schools. In Ghana, more than 1 million students are staying home. But while schools are temporarily closed for quarantine, learning must continue just that via different medium of teaching. Students are being educated remotely using technology. This is being done through a variety of online courses and electronic textbooks. To date, almost all countries in Europe, Central Asia and African region have instructed their primary, secondary and tertiary school systems to close completely or partially and adopt online, digital, internet and distance learning, to stop a possible virus spread among students and the general public. The question is, from an educational perspective, how would teachers and students cope with these alternative mediums of instruction in the absence of the regular face to face classroom? What is teachers' personal theory of teaching online? Are all teachers readily competent enough to handle teaching online? Does Ghana have a readily reliable internet facility which is accessible to all learners at every part of the nation? Are all learners (with or without disabilities) digitally inclined and possess devices to access online teaching and learning platforms?

4 Fox (1983), Theoretical Frameworks

According to Fox, as individuals, each teacher possesses a theory about teaching and learning. To elaborate on the concept of a teacher's theory of teaching and learning, Fox developed four personal learning theories. Each one of these theories includes the relationship between a teacher's personal theory of what teaching is, what learning is, and instructional practices are. The four personal learning theories are the transfer theory, the shaping theory, the travelling theory, and the growing theory. According to Fox, a teacher's response to the question, what is teaching, informs the teaching and learning that will occur within the teacher's classroom (p. 152). A teacher's personal theory of teaching and learning affects instructional decisions made or not made in the teacher's classroom. Fox categorized the personal learning theories as simple and developed theories. A discussion would be done on adopting the four personal learning theories as basis for teaching students online in this study.

4.1 Simple Theories and Developed Theories

Fox (1983) categorized four personal learning theories into two categories: simple theories and developed theories. Fox's personal learning theories are used to determine whether a teacher assumes responsibility for his or her student learning. The question is whether teachers feel their actions (taken or not taken) influence student learning. In simple theories, the teacher believes that teaching concepts automatically leads to student learning. These teachers feel that students who have not acquired the information taught are unmotivated or lack the skills necessary to learn the information being taught. In Fox's transfer theory, responsibility for student learning occurs before teaching; in Fox's shaping theory, responsibility for student learning occurs during learning. In the developed theories, the student is viewed as partnering with the teacher to determine and define the learning outcomes about the experiences and needs of the student (Fox, 1983). In the simple theories, the learning outcomes are already predetermined. With the developed theories, the teacher uses and applies his or her expertise of the subject matter in a manner that will make the learning meaningful for the students. Teachers who teach using the developed theories are open to leaving room for uncertainty during lesson implementation. Teachers who teach from the developed theoretical framework do not expend a great deal of time and energy on lesson planning. Teachers who meet Fox's developed theoretical framework remain open to what occurs during the learning process, make changes and modifications during the learning process, and regularly monitor and assess students' learning and adjust accordingly (Nicole, 2017 p. 21).

4.2 Transfer Theory

Fox (1983) used the transfer theory to describe teachers who believe that knowledge is a commodity that can transfer from one object to another. Teachers who adopt this personal learning theory believe that knowledge is information that can transfer from one person (the teacher) to another person (the student). These teachers focus on the "what" and "how" of knowledge with little to no attention to what happens to this knowledge received by the student. There is an emphasis on the knowledge that students will receive, and the instructional practices chosen to deliver this knowledge will have a direct impact on students' academic learning, needs, interests, and future endeavours. Blame associated with students not demonstrating possession of the knowledge imparted to them is attributed to the student because the teacher crafted and planned the lesson, and the choice of delivery was exemplary (Fox, 1983). The classroom lecture is an example of the transfer theory. During a classroom lecture, the teacher is making complex knowledge less complex and manageable (Fox, 1983). Fox (1983) suggested that there are two ways to view the transfer theory and its formation into a teacher's personal learning theory. At one spectrum, the teacher views him or herself for being primarily responsible for students' understanding of this complex knowledge and selects a delivery method to impart the knowledge so that it is less complex. At the other end of the spectrum, the teacher teaches the content, and the student must assume

responsibility for demonstrating an understanding of the content (Nicole, 2017 p. 22).

4.3 Shaping Theory

Fox's (1983) shaping theory is used to describe teachers who allow students the opportunities to make their own connections. Connection occurs when there is a relationship between the information taught and students' experiences. The shaping theory is supported by behaviourists who focus on learning and meta-cognition. An example of the learning environment of the shaping theory is the lecture hall or a laboratory where students engage in completing science experiments. The processes involved in the shaping theory include the teacher presenting students with problems and case studies, solving case studies and problems, and then requiring students to apply the information learned to a new set of problems and or case studies independently (Nicole, 2017 p. 23).

4.4 The Travelling and Growing Theories

The travelling theory includes a focus on the subject taught. Teachers who teach from this theoretical framework have knowledge of their subject matter and the various approaches for assisting students with acquiring this knowledge (Fox, 1983). Even with this knowledge, they recognize that teaching and learning are changing, so they remain open to learning new approaches and information to help their students acquire knowledge. This teacher knows that his or her students bring different perspectives to the learning experience and is open to learning new insights and considering information from a different perspective, even if suggested by their students. The teacher who teaches from the growing theoretical framework is similar to the teacher who teaches from the travelling theoretical framework with the exception that there is more of a focus on the student. These teachers are concerned about what is happening to the student during the learning process, such as whom and what the learner is becoming as a person as they acquire new knowledge (Fox, 1983). In this study, I categorized teachers as having either a simple or developed theoretical framework of teaching and learning (Nicole, 2017 p. 23). . Discussion on how Fox's theories of teaching and learning (simple or developed) could influence teachers' decisions to adopt online teaching and learning at this era of covid-19 pandemic.

Scholars correlated Fox's developed theoretical framework with characteristics that define student centred teaching beliefs (Kember, 1997; Samuelowicz & Bain, 2001). Fox focused on how university teachers perceived teaching and how the purpose of teaching related to learning (Fox, 1983; Kember, 1997; Samuelowicz & Bain, 2001). According to Fox, a teacher's perception of teaching defines his or her personal theories of teaching and learning as either a simple or developed theory of teaching and learning. Teachers who have a simple theory of teaching and learning perceive the teacher's role as being responsible for imparting knowledge to students. Teachers with a simple theory of teaching and learning also view the teacher as being responsible for shaping students' understanding of concepts. Teachers who describe teaching as guiding students through the process of active learning have a developed theory of teaching and learning (Fox, 1983). Developing these complex skills takes time and it is imperative that regular education teachers provide students with time and appropriate instructional support to develop their skills. Teachers with developed theory of teaching and learning attend to students' intellectual personal growth and development (Nicole, 2017 p. 24).

5 Need for using Information and Communication Technology

The National Council for Curriculum Assessment (NaCCA, 2019) of the Ministry of Education in the Ghanaian Standards Based Mathematics Curriculum stated that Information and Communication Technology (ICT) has been integrated into the Ghanaian curriculum as part of the core of education, alongside reading, writing and numeracy. Thus, the curriculum is designed to use ICT as a teaching and learning tool to enhance deep and independent learning. For instance, the teacher, in certain instances, is directed to use multimedia to support the teaching and learning process. ICT has the potential to innovate, accelerate, enrich and deepen skills. It also motivates and engages learners to relate school experiences to work practices. It provides opportunities for learners to fit into the world of work. Some of the expected outcomes that this curriculum aims to achieve through the use of ICT are:

1. improved teaching and learning processes
2. improved consistency and quality of teaching and learning
3. increased opportunities for more learner-centered pedagogical approaches
4. improved inclusive education practices
5. improved collaboration, creativity, higher order thinking skills; and
6. enhanced flexibility and differentiated approach of delivery

The use of ICT as a teaching and learning tool is to provide learners an access to large quantities of information online and offline. It also provides the framework for analyzing data to investigate patterns and relationships in statistical data (Ministry of Education; NaCCA, 2019, p. xvii). Once learners have made their findings, ICT can help them organize, edit and print the information in many different ways (NaCCA, 2019). Developing technologies for addressing problems at hand requires ingenuity of ideas, arts, technology and enterprise. Learners having this skill are also able to think independently and creatively. This competence promotes in learners the skills to make use of languages, symbols and texts to exchange information about themselves and their life experiences. Learners actively use digital media, participate in sharing their ideas, discover, acquire and communicate through ICT to support their learning (NaCCA, 2019).

5.1 Online Learning Environment (OLE)

Over the past decade, the Internet has had a profound impact on higher education by enabling the phenomenal growth of online learning. Moreover, just as we were getting used to fully online courses, blended courses, courses which integrate online and face-to-face instruction, seem to be growing in similar, perhaps even more spectacular, manner. Add to an excessive emerging digital technologies such as wikis, blogs, podcasting, social software, and serious gaming technologies that are increasingly being incorporated into online portions of courses, and one is tempted to despair of ever making sense of online learning. The altered learning environments created by web-based

technologies, not only eliminate barriers of time, space and arguably learning styles, providing increased access to higher education, they challenge our traditional notions of teaching and learning, and indeed higher education itself (Swan, 2019).

An Online Learning Environment (OLE) is a set of teaching and learning tools designed to enhance students' learning experiences by including computer and the internet in the learning process. Meaning of Online Learning Environment (OLE) According to encyclopaedia of educational technology (Siddiqui) Online Learning Environment can be described as online domains that permit Synchronous, collaborative interaction among teachers and students, while also providing Asynchronous learning resources for students at any time. OLE offers a learning system made up of many components with the entire advantages of computer – based learning. Definition As cited in (VLE, nd), Juan R. Pimentel defines an OLE as follows, We define an Online learning environment as one that allows learners to perceive the environment, assess situations and performance, perform actions and proceed through experiences and lessons that will allow them to perform better with more experience on repetition on the same tasks in similar circumstances. This definition of an OLE emphasizes the importance of learning. Learners in an OLE are expected to make use of and include examples, observations, experiences, situations, rules, concepts and techniques in a continuous (e.g., day by day or week by week), permanent (i.e., committing knowledge into memory) fashion to improve the performance of the execution of tasks (VLE, nd) (Muntajeeb, 2011 p.29).

5.2 Online Versus Face to Face Classroom

As cited in (Tamargo, nd, p. 27) observed that the Face to Face classroom could be sometimes an inhibiting environment for students and its structure can be pressurizing and intimating. Whereas the Online environment encourages freedom of expression and students are more open to communicate and express opinion and would often thrive in these environments. While these results are impressive and online environments have the obvious benefit of being more accessible than face to face classrooms, and are often a more flexible and convenient approach to education, they do however have several unfortunate consequences (Muntajeeb, 2011 p.29).

5.3 Implications of learning theories for online learning

The shaping theory of Fox has a backing from learning and meta-cognition which a focus of behaviourists.

For instance the shaping theory for online learning environment could be employed for a practical mathematical classroom where learners use realia to explain mathematical concepts and arrive at formulas or complete a mathematical proof. In the process of applying such theory web links to learners connecting them to audio visuals concerning the subject area and concepts to be learned including assigned inquiry based tasks relating to learners applying their discoveries to a real life setting. This makes the learner independent on decision making during problem solving.

5.3.1 Behaviourist theory of learning

Behaviourists including Skinner claim that learning is a change in observable behaviour caused by external stimuli in the environment and it is the observable behaviour that indicates whether or not the learner has learned something and not what is going on in the learner's head (Mohammed Ally, 2009). Explicitly, outcomes of lessons must be revealing to learners including the need and impact of learning materials; making lessons inquiry based and discoverable. Learners must therefore be tested, assessed and be provided with feedback.

5.3.2 Cognitive and information processing theory

The use of online may also not ignore the essence of the cognitive learning theory which involves the use of memory, motivation, and thinking, and that reflection plays an important part in learning (Schunk, 1991). Cognitivists see learning as an internal process. Thus the amount of information learned depends on the processing capacity of the learner, the amount of effort expended during the learning process, the depth of the processing and the learner's existing knowledge structure. In the use of online learning environment there must be the existing knowledge on how learners can surf the internet as well as being information technology (IT) compliance (Ertmer, & Newby, 1993).

A branch of cognitive-learning theory that hypothesizes information-processing learning model and maintains that is not observed by behaviourist states that;

- Human memory is not a passive repository for retaining information
- Memory is a complex structure that processes and organizes all knowledge
- Memory selects sensory data, processes, and transforms into meaningful information and stores much of the data

To adopt the cognitive theory in online learning considerations should be ensured on the information processing theory which proposes a model of the human brain as a computer with three memory stores;

- Sensory Registers – receives all information that a person senses
- Short-Term-Memory – working memory where new information is held temporary
- Long-Term-Memory – part of memory with unlimited capacity- new information stored must be linked to prior knowledge already stored
- An Executive control component of memory manages the various steps in the processing of information

Strategies should be used to allow learners to retrieve existing information from long-term memory; Pre-instructional questions can be used to activate the learners' existing knowledge required for learning the new materials. Information should be chunked to prevent overload during processing in working memory whiles online learning materials should present between five and nine items on a screen. Information should be presented in a way that learners can remember. Proper mode of delivery (audio, visuals, animations, video) needs to be ensured. Important information should be placed in the center of the screen and those critical for learning should be highlighted to focus learners' attention. Learners should be told why they should take the lesson and the difficulty level of the material must match the cognitive level of the learner. Different individuals use different learning strategies and online instruction needs to accommodate those differences taking into consideration those with and without learning disabilities.

5.3.3 Constructivist learning theory

Learners interpret information and the world according to their personal reality, and that they learn by observation, processing, and interpretation, and then personalize the information into personal knowledge (Merrill, 1991; Wilson, 1991). For the constructivist, contextualization of concepts of new ideas is vital for the learner to gain personal conviction. Theoretical ideas are based on John Dewey, Vygotsky, Bruner, Piaget, Gardiner etc. and the cognition group at Vanderbilt et al. To the constructivists;

1. Online lessons should arise from student interest – deployed standardization and advocated for flexibility and in relation to students' needs
2. Integration of Strands and sub strands –isolating topics prevented students from getting the whole knowledge
3. To be educated requires a process rather than an event- disagrees that that education is preparation for work
4. School curriculum needs to be linked to the cultural setting of learners in order to augment real life applications
5. Stages of learning must involve the use of manipulatives and not just abstraction
6. Center student learning around meaningful activities
7. Use of Internet to promote student communication
8. Use cooperative Learning with technologies to develop group projects

The summary for the basis of the constructivists' theory for online learning depicts the need to develop leaner's personalities which must be geared toward mastering their inner value through some personal activity directed and guided but must not force their will on them. The essence of making learning friendly by embedding concepts revolving around the cultural setting of learner and employing audio-visuals where learners themselves could inquire and discover aid the process of assimilation and accommodation. In situations where the principle of multiple embodiment is also adopted aid gives ample time for learners to explore enough to aid simulations discovering conjectures for themselves.

For the purpose of which learning theory may best fit for online teaching and learning; three schools of thought according to (Ertmer and Newby, 1993) all the three schools of thoughts could be classified orderly in designing materials for learning online where strategies for teaching facts demands the behaviourists, processes and principles requires the cognitivists and higher thinking levels that promotes situated and contextual learning employ the constructivists learning theories.

5.3.4 Discussing the need of the learning theory for online learning

Viewing the lens through Fox's and other theories mentioned above, two other theories commonly used to describe learning process exist that cannot be overlooked. Firstly, empiricism theory asserts that experience is a primary source of acknowledge acquisition. Under empiricism, knowledge is acquired through sensory impression. In the present case, video courseware may be explained by empiricism because it relates to sight and sound sensory for making impression. Secondly, rationalism theory asserts that knowledge is derived from reason without the aid of senses. Instructional design focuses on recording new information and recalling existing information or knowledge in the learner. Thirdly, behaviourism theory states that learning is accomplishes through response to environmental stimulus. Under this theory, learning acquisition is assessed through performance evaluation, such as using test score to appraise whether the learner responded correctly to the stimulus. Looking at the case of online learning, behaviourism may have part to play in the learning process. As learners access knowledge-base online, stimulus is imparted whiles evaluation may be accomplished by test score. In the context of video courseware, behaviourist may contribute to optimal learning output because video course-ware aims at sensory stimulation to augment knowledge acquisition. Cognitivism is prevalently used in modern education research. The goal of the instructional design is to target mental process of the learner. Rationalism, behaviourism and cognitivism theories could best support the use of video courseware in eLearning. Video courseware provides a stimulus to motivate students to learn. These sensory stimulations would be recorded and recalled at later time. In so doing, learners would engage in complex mental processing, such as assessing the content of the video and the body of knowledge disseminated by the video. We note that in eLearning research, there are lots of debates and discussions exist relating to the part technology plays (Beynon, 2007; Clark, 2001; Kozma, 2001). Clark claims technology is just a tool for lesson delivery or medium of instruction; it does not affect the lesson outcome. Nevertheless, the implementation of technology in eLearning continues because online learning is convenient by allowing both learners and their facilitators to save time and space. For the purpose of searching for an effective means for delivery instructional tool and allowing learners to collapse time and space, our research on the demand for video course was undertaken.

6 Access to E-books

E-books are new tool for sharing information in learning environment. As cited in (Galloway, Boland, & Benesova, 2006), Siegel and Sousa state that, the goal of online text books is to move learners skills to include evaluating and synthesizing information from diverse sources; understanding and applying the difference between fact and opinions; grasping multiple and diverse perspectives; and drawing insights from these perspectives within the context of one's own knowledge base and experiences, thus the web seems to be more suitable for this than the textbooks in many ways (Muntajeeb, 2011 p.29). The Ministry of Education recommended the "open university uk" and "icampus" platforms to Ghanaian learners to access online learning materials that can enhance their studies and also advocated for a zero rate for online learning materials from internet service provider.

7 Interventions

What we are learning from COVID-19, similar to what we have seen in previous pandemics, is that preparedness is crucial. While different scenarios exist, several of them assume that the COVID-19 spread will happen in waves, which means the process of addressing it should be cyclical. Countries not yet impacted should begin "preparing," starting with a response plan. This would

facilitate "coping" once the crisis hits and minimizing the negative impacts. The plan can include introducing protocols for screenings in schools, rolling out hygiene practice campaigns, imposing school closures, offering distance learning, using closed schools for emergency purposes, etc. (Kaliope & Tigran, 2020). As revealed by Kaliope & Tigran (2020), the emergency phase dissipates, communities could move into a "recovery" mode, with governments implementing policies and measures to regain lost time. The approaches may include adjustments to the academic calendar, prioritizing students in grades preparing for high-stakes examinations, and continuing with distance learning in parallel to schools. Countries that have shown greater resilience in repeated crises, such as those in East Asia, are the ones that were able to benefit from lessons learned and to respond quickly to new crises, such as this one. They have been able to use the momentum to re-prepare, investing and reinforcing systems going forward.

It is critical to jointly work building on the experience of previous outbreaks (SARS, Ebola, etc.) in support to Governments in understanding the options available. The World Bank is working with countries across the globe in each of the three stages of preparing, coping and recovery. Educational administrators and policy makers can use this crisis as an opportunity to introduce new learning modes that can reach everyone, to prepare for emergencies, and to make the system more resilient(Kaliope & Tigran, 2020,). With schools closed due to the outbreak of COVID-19 most countries have moved quickly to social media and virtual group platforms to stay in touch with members. It has also liaised with public authorities making sure there is a continuous and equal access to educational resources for all children.

In Ghana, schools closed on 16th March as part of the country's measures to slow the spread of the Coronavirus Disease 2019 (COVID-19) amongst learners. And as the education minister addressed the nation on 24th March, 2020 the country quickly needs to establish new channels of communications for teachers to liaise directly with learners. These channels included; social media and chat groups to continuously inform learners, traditional television and radio. Learners were advised to visit online platforms like Open University UK. The Ministry of Education in collaboration with the information and communication ministries advocated for zero rate online learning materials from service providers, ensuring access to the national digital project for national coverage.

Publishers could be asked to make available school resources on diverse subjects, so that teachers can easily use them. Free internet access for all students and teachers until the end of the emergency situation could also aid both teachers and learners. Although the Education Ministry has responded positively to some of the needs, lessons could be recorded and broadcast on national TV whiles Internet providers cut their fees in half.

A speech delivered by John Swinney MSP Deputy First Minister and Cabinet Secretary for Education and Skills at Scottish Parliament on 19th March, 2020, stated that;

"Teaching and learning support will continue – albeit in different ways for different groups of learners. For the majority, this will be through distance learning and online learning, with different forms of on-going contact with teachers rather than in-school, face-to-face. Teachers and other staff, who are well, will continue to be working. Senior phase pupils with coursework for national qualifications to complete will be informed by their schools how to complete this.

My statement today will provide more detail about what these mean in practice, and how our teaching and education workforce can re-focus their work to support pupils in a range of different ways in the weeks and months ahead. We want our local and national authorities to be able to exercise the necessary flexibility to enable the education workforce to operate in new and different ways to support learners. There are three ways in which this should be the case and this approach may be have to be discussed and agreed with local government:

Firstly, we need to continue to support **vulnerable children**: we will not cut adrift vulnerable young people, who often rely on school life for hot meals or for a safe, nurturing and supportive environment.

Secondly, we want to deliver as much **educational continuity as possible**: we want local authorities and teachers to do all they can to ensure educational continuity for our children and young people, with a particular focus on basic school pupils who need to complete coursework for national qualifications. Teachers can provide educational continuity for children in the broad general education in a variety of ways; for example through setting weekly learning tasks and emailing these to families where possible, or using Glow and other online learning platforms. I am confident that the teaching profession will respond in a variety of imaginative, creative and simulating ways to support continuity in learning for pupils" (John Swinney, 2020).

In Ghana, several measures are put in place to equip the readiness of teachers especially at the Colleges of Education level in order to ensure proper online instruction and lesson delivery. To ensure continuity in students' learning, Transforming Teacher Education and Learning (T-TEL) has been looking to find a solution in online education initiatives. Such initiatives include the use of online synchronous communication, design, delivery and assessment of online learning activities within a virtual learning environment. Dr. Dimitrios Vlachopoulos of Amsterdam University of Applied Sciences is facilitating a course in Online Education which is an excellent opportunity for college tutors to understand online education and enhance their teaching practice through acquiring relevant skills for moving their lessons. This course which is offered through Digital Society School, Amsterdam University of Applied Sciences is discounted for all tutors from Ghana where participants would be certified after successful completion of all 8 modules in course duration of 2 weeks starting from April 2020. The training course aims to support tutors in their new role in online education, through the completion of 3-hour autonomous modules, where tutors will be introduced to the essential elements of online learning.

Learning how to design online course and creating a productive learning experience for learners has become very expedient because most Ghanaian teachers were not adequately prepared for such innovations of teaching due to the countries usual approach of face-to-face until the intrusion of covid-19 pandemic into all educational systems globally.

The Ghanaian teacher now needs to be trained on how to design and develop online instructional module through evidence-based decisions. Specifically teachers need to be introduced to the principles of learning design, understanding phases of learning design models in order to grasp formal or non-formal education environments with emphasis on the online element including related topics relevant to their discipline. This will enhance and aid teachers to prepare their own online module, which can be used in their teaching/professional practice.

Since not everyone teacher has an online pedagogical background, in preparing teachers towards this goal a conceptual clarification is necessary before taking over the role of online teacher. Like society, the concept of online education is subject to constant change. The different understandings of this concept are conditioned by professional approaches and interests. An agreement on how to define online education and other similar terms could help teachers identify models and practices for applying these concepts and determine the key factors for better and more effective use of this type of teaching and learning.

For an effective online education delivery, out of the communication related or any kind of barriers, there should be consciousness on the roles of the teachers and students in the teaching and learning process.

Description and exploration of different pedagogical models implemented by online educational institutions needs to be examined: need for face-to-face presence, evaluation, interaction & use of technology.

Several strategies, applications and tools considered useful for formative instructional practice and formative assessment to elicit evidence of student learning need to be made known and readily available to teachers via "open access". These processes may also require providing teachers with the creation and implementation of online materials as part of a curriculum design process for online environments. In addition, good practices of how traditional learning materials can be used in online education, setting instructional objectives, learner analysis, context analysis, task analysis, sequencing and strategies needs to be known.

7.1 Using remote learning and education resources to mitigate loss of learning

In managing the impact of COVID-19 on education systems around the world and how countries are preparing, coping, and planning for recovery Kaliope & Tigran (2020) discloses that many countries have turned to distance learning as a means of mitigating for lost time in school (fully online in China, Italy, France, Germany and Saudi Arabia; mobile phones or television in Vietnam, Mongolia). In addition to infrastructure and connectivity, teachers' and administrators' familiarity with the tools and processes are also key factors in providing distance learning (Singapore). Other countries send kids home with lessons as homework (Lebanon). In Bulgaria, more than 800,000 accounts have been created for all teachers and parents, publishers have been mobilized to open the digital textbooks and learning materials for grades 1 to 10, and two national TV channels will broadcast educational tv. As more countries close schools, more creativity will be needed. For instance, adapting existing platforms for use in smartphones, and/or agreeing with telecom companies to eliminate the cost of accessing material from a Ministry of education site could be part of the mitigation efforts (Kaliope & Tigran, 2020).

7.2 Feasibility of Interventions

Teachers are being asked to deliver their lessons through online platforms. However, not all teachers and students own a smart-phone or a computer and are knowledgeable in the use of online platforms. In addition, there is no access to the internet in remote areas, and, in general, broadband costs are very high, so not everyone can afford it. To make lessons for all classes available daily on all national TV channels would allow for a broader reach and would help to ensure that every child, no matter his/her geographical location, would be able to access educational resources. But the challenge here in Ghana is the issue of access to electricity and reliable network.

7.3 Progress

In China, a massive effort is underway to make sure children keep learning. Technology seems to be the answer. We will only know how effective this is after the crisis, but it does seem to be a good use of children's time. Home schooling might be an answer, but this option is not very widespread outside of the United States especially Ghana. In Europe and Central Asia, there are diverse set of unequal levels related to development and income amongst countries. Spreading the use of technology availability is key, as the availability of online learning materials, as well as devices and the level of internet connectivity at home (Cole, 2000).

At the same time, one more important question is: can students actually benefit from technology at home? Here we clearly have an equity issue. While financially well-off families can afford computers and multiple devices, students from struggling families can hardly afford simple devices and may likely not have the internet at home. For example, PISA 2018 data from (Belarus, 2020) confirms the lack of any device puts students at a large disadvantage in terms of educational achievement. It is also an indicator of poverty.

In terms of internet connectivity at school, Ghana may have the basic capabilities that enable schools to deliver instruction using technology although several other schools may lack this capacity. What is happening on the other end of the internet cable? In many regions we see that home connectivity has become widespread and home internet connections may enable students to connect to different type of learning resources.

As many tertiary institutions have been implementing computer equipment programs in the region over the last few decades, they are better positioned in terms of technological equipment in schools. For instance, if an assessment of the IT equipment and internet connectivity in schools is rolled out, few of them may have basic resources to ensure the minimum ability to deliver content. Quite a few may be in the position to provide good computers and networking with decent internet connectivity and robust security. Yet, with all this progress in educational

institutions, several of them may not be in the position of being fully equipped nor fully connected to the internet.

In Ghana most school systems especially basic and secondary do not use digital content in education. Few institutions use digital learning resources in teaching, but only at the tertiary level. Less than 10 percent of these tertiary institutions may have more robust digital learning capabilities with some of the educational content available outside of school. The nation as a whole has no universal curriculum-linked resources for teaching and learning, regardless of place and time. Distance education capabilities are also limited in Ghana. This is because there is zero to minimal distance education capabilities especially at the pre-tertiary level. The public universities have better capabilities, but none have integrated curriculum widely delivered with a blended mode. As a nation we need to think about the state of distance education. Traditionally, distance education could be conducted through national television and radio stations. This is not the case today. Yet, we do not see tremendous progress in terms of its use. It likely appears that the traditional school education just does not need distance technology. At the same time, countries like Ghana that lack access to good teaching in remote areas could try to use this capability for education improvement, both by using broadcast on national radio and television stations leveraging the potential of ICT. This is where teacher training with digital technologies and applications becomes important.

8.Conclusions

Though most Ghanaian public universities are putting measures in place ensuring that there is a continuous education taking place through internet, online and distance learning during school closure, access to technology in most households may vary, and access to high bandwidth internet to smart-phones which attracts cost becomes a burden for students across the country. The implications of any virtual learning communication system to enable educational institutions to continue functioning requires high cost. Since downloading reading materials, course manuals and handbooks, whilst submitting exercises, assignments as a result of this development create discomfort to students. Most students are also not trained in regards to this form of education where ICT compliance is a necessary skill needed for an integrated video courseware for eLearning, where online resources such as website, serves as a hosting location for students to retrieve and send video, audio, text and interactive modules. These circumstances has brought to bear the essence of focusing on the need to integrate a well-built information communication technology systems, digital libraries, integrated online curriculum with lessons for all learners especially at the pre-tertiary level.

9.Significance

A time of crisis is also an opportunity for all education systems to look into the future, adjust to possible threats, and build their capacity regardless of COVID-19. Initiatives towards technological interventions for online and distance learning would be taken up by stakeholders in educational institutions and the nation as a whole.

10 Recommendations

So, what should Ghana focus on? Here are a few ideas:

1. Target programs to include the most vulnerable children with equipment and connectivity.
2. Improve connectivity for areas that need it most
3. Improve financing of digital curriculum and materials (digital libraries, lessons, learning items, etc.).
4. Improve telecommunication capabilities for schools to be able to deliver education online.
5. Educational tools employed for teaching online should be both synchronous and asynchronous to satisfy most learners.
6. Review assessment policies to suit online lessons.
7. Research into examining the impact of virtual online learning on students' academic performance.

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