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Impact of the Coronavirus Pandemic on Global Education

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Abstract:

Human existence, since time immemorial, has been plagued with epidemics and pandemics. These significant medical terminologies are often used interchangeably. However, they have distinct meanings. Many leaders of global countries welcomed the news of the exponential impact of COVID-19 on their respective economies, and on the entire world with disbelief. However, the stir caused and socio-economic impact of the pandemic on global education cannot be underestimated. The purpose of this research was to examine the disruptive effect of COVID-19 on educational programmes and activities in countries and territories across the globe. The quantitative approach to scientific inquiry was adapted and used in the study. Specifically, the research relied on cross-sectional design. This facilitated the collection of relevant research data over a specific period. Data required for the conduct of the research were obtained predominantly from secondary sources. These included text books, peer-reviewed articles published in journals, research papers, newspaper publications; Google Search Engine including worldometers.info, africanews.com, ghanahealthservice.org, who.int, and weforum.org; and electronic databases of international bodies such as UNESCO, among other significant sources. Respective data on pre-primary through secondary levels, and tertiary level of education for 108 countries across the globe; population data for each of these 108 countries; and available data on COVID-19 during the period were used in the study. Regression models and descriptive statistics were used to describe the research variables; and to evaluate their behaviour over the stated time frame on global education. Findings from the research revealed positive and significant relationship between total learners' population (independent variable) and total national population (dependent variable) ($p = 0.006$, $p < 0.05$). The results suggested total learners' population accounted for about 98.97% of the variation in total national population values, implying less than 2% of the outcome could be explained by external random factors. The research revealed strategies adapted to re-open schools in five major regions across the globe. The extent of influence of the independent variable on the dependent variable suggested continuous school openings during the COVID-19 outbreak; and re-openings after school closures occasioned by COVID-19 without recourse to efficient and effective implementation of pharmaceutical and non-pharmaceutical interventions and protocols could trigger further spread of the virus within and across borders. The magnitude and propensity of the COVID-19 outbreak on effective planning and co-ordination of academic programmes and activities in countries and territories across the globe were underestimated at the initial stages by many leaders, nationals, and non-nationals. The estimated total learners' population (1.63 billion) affected by COVID-19 called for adaption and implementation of immediate, medium- and long-term measures at the national, sub-regional, regional, and global levels to prevent similar occurrence in future. Further, sustained educational programmes and activities throughout a given academic year are contingent on various leaders' ability to control internal and external factors such as pandemic outbreaks that have the potential to wreak havoc and cause disruptions. During epidemic and pandemic outbreaks, decisions on school closures must be taken early to avert uncontrollable spread. COVID-19 affirmed inevitable role of the hybrid system in effective educational service delivery in current and future periods. Africa's share of total consumption of international Internet bandwidth; and electricity generation and supply must increase significantly to reflect the continent's commitment to improving on existing structures to assure efficiency and effectiveness in educational service delivery. There is an urgent need for classical instructors to evolve quickly to adapt modern teaching methods and practices, so they are not left behind in the dynamic and ever-changing global teaching and learning environment.

Keywords: Coronavirus, COVID-19 updates, global education, school re-opening strategies, pandemic

1. Introduction

Human existence, since time immemorial, has been plagued with epidemics and pandemics. These significant medical terminologies are often used interchangeably. However, they have distinct meanings. Explanations provided by Saunders-Hastings and Krewski (2016) aptly describe these terms. The authors noted epidemics are driven by seasonal influenza strains, which result in local spikes in infection incidence whereas pandemics refer to epidemics that spread across the globe. Thus, the term epidemic on one hand, is used to describe an infectious outbreak which occurs, and restricts itself to a given locality or jurisdiction such as a country. On the other hand, the term pandemic describes an infectious outbreak which spreads beyond a given jurisdiction into another or other jurisdictions across the globe. Recall,

the Coronavirus outbreak was first recorded in Wuhan City in the Hubei Province in the People's Republic of China. Successful containment of the outbreak in China could be described as an epidemic. However, as the infection rate increases in leaps and bounds beyond the borders of China into other countries across the globe, the outbreak migrates from an epidemic to a pandemic. Stated differently, epidemic explains a 'limited' infectious outbreak whereas pandemic describes a widespread infectious outbreak.

Narratives and statistics shared by medical historians revealed the earth planet has recorded quite a substantial number of epidemics and pandemics in prior and recent years. The influenza outbreaks in 412 BC and 1580 is notable examples. In 1729, an infectious outbreak which commenced as an epidemic in Russia later metamorphosed into a pandemic and spread quickly across Europe within six months; and across the globe in three years. High morbidity and mortality rates and multiple waves were recorded during the pandemic period. A pandemic outbreak in China in 1781 spread through Europe and Russia over a period of eight months. The effect of the latter pandemic outbreak on the young adult population was dire. The world had another pandemic outbreak to contend with in 1830. The magnitude of this pandemic was comparable to the Spanish flu pandemic in 1918. The 1830 pandemic was believed to have originated from China and spread through Southeast Asia, Russia, and Europe. By 1831, the pandemic had spread to North America. Low mortality rate was recorded during the 1830 pandemic outbreak albeit; it was wrought with significant rate of illness attacks (Saunders-Hastings and Krewski, 2016).

In 1889, another infectious outbreak was recorded in Russia. The outbreak which was initially detected as an epidemic later transformed into a pandemic and spread by rail and sea across North America and Europe. The range of the total case fatality rate was between 0.1% - 0.28% while the rate of spread was believed to be faster than the rate recorded in prior pandemic periods. The total number of human casualties was estimated at one million people. Some medical historians noted the rate of infection was indicative of the speed of spread of emergent diseases or ailments, owing to considerable progress in the area of transportation technology. The following pandemics occurred over the last century: Spanish flu (1918 - 1920), Asian flu (1957 - 1958), Hong Kong flu (1968 - 1970), and Swine flu (2009 - 2010) (Saunders-Hastings and Krewski, 2016). More recent outbreaks include the Severe Acute Respiratory Syndrome or Middle East Respiratory Syndrome (2002 - 2003), Ebola (2014 - 2016), and Coronavirus (2019 - 2020). One of the highest if not the highest thus far fatality rate in human history was recorded during the Spanish flu outbreak. The case fatality rate recorded during the period was estimated at 2%. Gates (2020) noted the severity of the COVID-19 pandemic and estimated its case fatality rate around 1%, which is lower than the 2% recorded between 1918 and 1920 in the Spanish flu pandemic, but higher than the fatality rate (0.6%) recorded during the Asian flu. Thus, Gates (2020) estimated the case fatality rate of COVID-19 (1%) between the respective case fatality rates recorded during the Spanish flu (2%) and Asian flu (0.6%).

A study conducted by Gates (2020) revealed two arguments why COVID-19 remained a threat to countries across the globe. First, the lives of adults with pre-existing conditions and healthy adults were at risk. Second, on average, an infected person could spread the virus to two or three other individuals; persons with mild illnesses or exhibit symptoms could spread the virus to others with relative ease. This implies the mode of transmitting the COVID-19 virus to others was very efficient. Experts observed containment of the Coronavirus pandemic was more challenging than the Severe Acute Respiratory Syndrome (SARS) because the rate of spread of the former was exponential. The spread of SARS was facilitated by individuals with symptoms, and with less efficiency. The foregoing explanations affirm the relative potency of the novel Coronavirus. A brief comparative analysis of the same period revealed the total number of confirmed COVID-19 cases was about ten times the number recorded by SARS.

The occurrence of a novel pandemic across the globe was predicted early by Gronvall, Waldhorn and Henderson (2006). Gronvall et al. (2006) predicted the novel pandemic may be caused by bioterrorist attack, H5N1 avian influenza, unknown pathogen, or different influenza; and that, the occurrence of the novel pandemic was just a matter of time. Predictably, the global community succumbed to the Swine flu outbreak in 2009. This was barely three years after the prediction by Gronvall et al. The authors identified some challenges associated with scientists' ability to work effectively on pandemic cases. One of the greatest challenges saddled with scientists during pandemic outbreaks is how to ensure effective characterisation of pathogen and determination of its control measures. The revelation by Gronvall et al. is strongly supported by challenges confronted with scientists in determining the appropriate vaccine or vaccines for the novel Coronavirus pandemic, which continued to claim many lives across the globe. Nonetheless, the differences between pandemics and epidemics imply different scientific and political dimensions to addressing the challenges emanating thereof. These differences pose a significant threat to effective planning towards containment and prevention of further spread of epidemics and pandemics.

The existing literature suggests most of the pandemics recorded thus far across the globe trace their origin to Asia. As an example, some medical historians trace the origin of the Spanish flu, Asian flu, Hong Kong flu, and the novel COVID-19 to the People's Republic of China. Available statistics indicated between 40 and 50 million lives were lost during the Spanish flu outbreak while the number of human casualties recorded in the Asian flu was estimated between 1 and 2 million. The Hong Kong flu resulted in deaths of between 500,000 and 2 million people. However, the origin of the Swine flu was traced to Mexico in North America. The Swine flu claimed about 575,000 lives. The evidence suggests, so far, the Spanish flu has been more detrimental and catastrophic to human existence and survival than any other prior pandemic in medical history. Some medical experts described the Spanish flu as the 'greatest medical holocaust in history' (Waring as cited in Saunders-Hastings and Krewski, 2016, pp. 2 & 3), owing to its magnitude and fatality rate.

Succinct explanation for the COVID-19 outbreak was provided by Reynolds and Weiss (2020c). The authors defined Coronaviruses as a large cluster of viruses known for infecting humans and animals. In the former, COVID-19 causes respiratory illnesses. These range from common cold to more serious infections or ailments. A member of the

Coronavirus cluster known to have caused socio-economic havoc in recent years was the Severe Acute Respiratory Syndrome. A virus which started as an epidemic in China in 2002 morphed into a pandemic affecting twenty-six countries; and resulting in over eight thousand confirmed cases and seven hundred and seventy-four deaths. Presently, dry cough and fever are the most common symptoms associated with the COVID-19 disease. Other symptoms include acute respiratory tract illness such as bronchitis and pneumonia.

1.1. Background of the Study

An epidemic outbreak called the Coronavirus was experienced in China in December 2019. The spread of the virus was believed to have initiated from a fish market in Wuhan City in the Hubei Province. Statistically, Wuhan City has an estimated population of sixty (60) million people. Therefore, it may not be difficult to fathom the size of the population that was immediately affected by the spread of the Coronavirus. Many members of the global community and actors readily counted on the technological exploits of China to be pivotal to her ability to douse the flames of the Coronavirus; and to prevent its further spread within and across borders. However, the early containment measures adapted and implemented by China proved ineffective as evidenced in further spread of the virus to greater Hubei; and to other provinces in China.

Health authorities in China identified a strain of Coronavirus that had never been encountered in humans before as the cause of the infections. This information was shared on 7th January, 2020 while genetic sequence of the identified virus was shared with the rest of the world by China on 12th January, 2020. The information on the genetic sequence was shared to enable health authorities in other jurisdictions develop their own diagnostic kits to contain and prevent further spread (Reynolds & Weiss, 2020c). Evidence to the latter was apparent in series of confirmed reports of COVID-19 infections by health professionals in many countries and territories across the globe (Reynolds & Weiss, 2020b).

Information on the novel Coronavirus was officially conveyed to the World Health Organisation (WHO) by China on 31st December, 2019. After preliminary laboratory tests, the World Health Organisation confirmed the virus' ability to cause respiratory illness in a group of people. The official confirmation from WHO was announced on 21st January, 2020 (Elsevier, 2020). During the same period, human-to-human transmission of the Coronavirus disease was confirmed by the World Health Organisation. On 11th February, 2020, WHO officially named the Coronavirus, COVID-19 and identified the *Severe Acute Respiratory Syndrome Coronavirus 2* or *Sars-CoV-2* as the virus that caused the disease (Reynolds & Weiss, 2020a, para. 6).

Extant medical laboratory research affirmed generally, human-to-human transmission of COVID-19 was common. Therefore, a common belief among health experts was the first group of persons who were infected had contact with animals. Apparently, the fish market in Wuhan is noted for illegal trading in wild animals such as birds, marmots, snakes, rabbits, and bats. The foregoing remained the contention although some medical researchers-maintained animal source of transmission to humans remained a puzzle. A research paper released by a team of virologists at the Wuhan Institute of Virology revealed a commonality in the genetic makeup of COVID-19 and the Coronavirus found in bats. Further, the research revealed the genetic makeup of the former is ninety-six per cent (96%) identical to that of the latter (Reynolds & Weiss, 2020b).

In another development, research conducted and published in March 2020 established similarity in the genetic sequences of human coronavirus and the coronavirus in pangolins. The similarity was estimated between 88.5% and 92.4%. Reynolds and Weiss (2020b) noted some earlier confirmed cases of the novel Coronavirus were not linked to the Wuhan fish market. This implied some human infections might have been recorded prior to the Wuhan fish market catastrophe. The Wuhan market was shut down for inspection and cleaning on 1st January, 2020. The authorities' decision was intended to avert possible spread of the Coronavirus outbreak. However, as at the time of inspection and cleaning, it appeared the virus had spread beyond the market thereby straining any efforts to limit its spread to the Wuhan fish market (Reynolds & Weiss, 2020b). In the early stages of the pandemic outbreak this year (2020), some countries offered to evacuate their respective nationals voluntarily from China. Notable among these included Belgium, Spain, Iran, and Italy. These countries resolved to quarantine their respective nationals who arrived from China for fourteen days. The rationale was to ensure early detection of symptoms, confirmation of active cases, and prevention of further spread of the virus in their respective jurisdictions.

Nonetheless, countries that offered early evacuation from China had difficulties with early detection and treatment due to the elusive nature of COVID-19. The quarantine measures instituted by these countries were expected to contain and prevent spread of the novel COVID-19. Contrary to expectations, the evacuations escalated spread of COVID-19 across borders; and new cases were speedily confirmed in Italy, Iran, South Korea, and Spain; and in many other countries around the world. Sooner than later, the novel COVID-19 which surfaced as an epidemic in China had morphed into a global pandemic. Immediate vaccines for cure of the virus were not available. As a result, countries and territories with reported cases and potential ones were impelled to improve on their preparedness and responsiveness while ensuring strict enforcement of non-pharmaceutical measures, including cancellation of mass gatherings, regular hand washing, social and physical distancing, and schools' closures, among others.

Notwithstanding the tremendous efforts by China to curb further spread of the COVID-19 outbreak, the overwhelming impact on Hubei Province was frightful. Generally, sporadic spread of pandemics is occasioned by two major factors: the *time or serial interval* and *reproduction number* (The World Economic Forum, 2020, para. 7). The time interval relates to the time it takes the virus to spread whereas the reproduction number refers to quantity. Specifically, reproduction refers to the estimated number of confirmed cases and infections. The average serial interval for COVID-19 was believed to be four days. This implies COVID-19 spreads geometrically around the world; the pace of spread of the pandemic is very fast. Given the speed of spread of the virus, experts believed possible containment and prevention may be

a challenge. Record cases in the United States, India, Brazil, Russia, Colombia, Spain, and Argentina, to mention a few, lend credence to the foregoing assertion. Adaption of aggressive measures by various countries to curb further spread while ensuring containment is imminent. This corroborates Saunders-Hastings and Krewski (2016), Gronvall et al., Malik, Mahjour and Alwan (2014), Malik and Mahjour (2016) who found extended serial interval for early pandemics, but short for recent outbreaks; and predicted imminent outbreaks in the near and distant future.

Professor Myers and her team (as cited in World Economic Forum, 2020) examined more than four hundred and fifty reported cases drawn from ninety-three cities in China. The team's examinations confirmed asymptomatic spreading of COVID-19. That is, persons with no symptoms had the potential to spread the virus. The test results revealed more than one of ten (10) confirmed cases in China was transmitted from asymptomatic patients or persons. It was believed that results from the specimens tested by Meyers and her team could douse earlier scepticism about the spread of the Coronavirus pandemic through asymptomatic transmission. Further, the results were expected to enhance containment measures by infected countries and territories around the globe. Meyers (as cited in World Economic Forum, 2020) affirmed the inevitable role of extensive non-pharmaceutical interventions such as cancellation of mass gatherings, restrictions on travels, quarantine, isolation, and school closures in the fight against spread of the COVID-19 outbreak. Meyers (as cited in World Economic Forum, 2020) emphasised increasing case counts and silent transmission were consistent with asymptomatic transmission of the Coronavirus in many countries and territories throughout the world. She concluded the probable elusiveness of COVID-19 affirmed the need for global economies to adapt extreme measures to contain and prevent further spread.

The World Economic Forum (2020) chronicled a set of reasons for the exponential spread of COVID-19 across borders. Notable among these included the infection of asymptomatic patients, and their potential spread to others. That is, the likelihood that persons with no traits of the virus would be infected; and they in turn would transmit to others benignly. As stated earlier, results from laboratory tests conducted by Meyers and her team (as cited in World Economic Forum, 2020) showed asymptomatic infection accounts for one of ten reported Coronavirus cases. Results compiled from recent tests revealed the average serial interval for transmission of COVID-19 from one person to another was less than a week; it was about four days. Prior studies showed an average of fourteen-day transmission period. Further, more than ten per cent (10%) of individuals become infected from persons with the virus and yet, were asymptomatic. That is, they did not show signs of symptoms of the Coronavirus. Some experts believed COVID-19 could be likened to flu; they based their argument on the ominous nature of the virus.

1.2. Problem Statement

Prior information on the outbreak of the Coronavirus, officially called COVID-19, at Wuhan City in the Hubei Province in China was greeted with scepticism by nationals, non-nationals and leaders of many developed, emerging, and developing countries around the world. Many leaders of global countries welcomed the news of the exponential impact of the Coronavirus pandemic on their respective economies, and on the entire world with disbelief. True to prior predictions by the World Health Organisation, the world continued to witness and record surging numbers of reported cases, deaths, recoveries, and active cases, among other major determining variables of analysis on COVID-19. Consequently, the world continued to struggle in its quest to find a medical antidote to the pandemic. Medical laboratory tests conducted in some countries across the globe were yet to provide the requisite medical solution or prescription for the outbreak.

The stir caused and socio-economic impact of the pandemic on global education cannot be underestimated. Recall, an outbreak which commenced in China as an epidemic sporadically penetrated a significant number of countries and territories throughout the world. As at 20th March, 2020, China had the highest number of reported cases (80,967) followed by Italy (41,035), Iran (18,407), and Spain (18,077) respectively. Thus, the People's Republic of China remained the epicentre of COVID-19 during the period. However, as at 25th June, 2020, the narratives had changed considerably; the United States of America had become the epicentre of COVID-19 with total reported cases of 2,463,923, followed by Brazil (1,193,609), Russia (613,994), India (474,587), United Kingdom (306,862), and Spain (294,166). The total number of reported cases in the United States constituted about 25.76% of total number of reported cases across the globe (9,565,546) during the period. Correspondingly, the United States recorded the highest number of deaths (124,308), representing about 25.29% of total deaths (485,690) reported around the world during the period. Significant death tolls were recorded by Brazil (53,895), United Kingdom (43,081), Italy (34,644), and Spain (28,327) during the period (Worldometer, 2020b).

The respective total number of confirmed cases, deaths, recoveries, active, and critical cases across the globe on 20th March, 2020 were 246,107; 10,049; 88,483; 147,575; and 7,389. The number of countries and territories increased from 177 to 182 during the period. However, the story was significantly different on 29th March, 2020: the respective total number of confirmed cases, deaths, recoveries, active, and critical cases across the globe surged to 678,910; 31,771; 146,339; 500,800; and 25,377. The respective data recorded during the period were 181.97%; 219.21%; 68.81%; 247.46%; and 253.19% higher than those recorded earlier on 19th March, 2020. The significant increase in the total number of reported cases (about 181.97%) and deaths (about 219.21%) in less than two weeks (from 19th to 29th March, 2020) raised concerns about the world's preparedness to curb further spread of the pandemic. It also raised major concerns about the safety of learners, instructors, and administrative staff in academic institutions at various levels during the period.

Due to the increase in awareness and campaign on the importance of formal education in many countries and territories, school enrolment rates have increased considerably in advanced and in many emerging and developing economies across the globe. Thus, the total learners-to-total population ratio of many countries has improved significantly in recent years. Even if school children were found to be asymptomatic, the probability of these children transmitting the

virus to their respective instructors, siblings, parents, grandparents, guardians, and caregivers remained very high. This raised questions about the possible effect of continued schools' openings during the COVID-19 outbreak on further spread. As of mid-March 2020, the impact of COVID-19 on academic systems and structures became apparent, impelling closures of learning institutions at various levels across the globe. Available statistics affirmed as at 23rd March, 2020 more than 1.3 billion learners were no longer academically active following closures of academic institutions in the wake of the Coronavirus outbreak. The school closures affected more than half of the global learners' population in more than one hundred countries during the period. The potency of the Coronavirus placed older persons and individuals with pre-existing medical conditions at risk. As a result, learners in their teens and twenties who were potentially asymptomatic stood the chance of spreading the virus to older persons and persons with pre-existing conditions that they may come into contact with. The imminent question is: *how prepared and responsive were individual countries and territories across the globe to the COVID-19 outbreak to prevent its further spread; and to minimise its overwhelming impact on academic activities in their respective economies and across the globe?*

- The general management problem is the failure of some global leaders to pick early warning signals to facilitate immediate identification, development and implementation of the requisite medical and security measures to curb the spread of the COVID-19 outbreak; and to curb its threats to academic systems of economies around the world. Available statistics indicate the respective learners' populations of economies such as China (including Hong Kong and Macao) (275,436,085), United States (55,100,000), Mexico (37,589,611), Egypt (26,071,893), and Ethiopia (24,686,497), among many others, were adversely impacted by the initial school closures. Collectively, they constituted a significant portion of the learners' population globally. Given the valuable role of economies such as China and the United States in global technological advancements, early detection and solution to the outbreak in these countries would have been vital and complementary to global containment efforts; and pivotal to the avoidance of widespread school closures across the global. Though evidence of the phenomenon exists, there are no empirical studies to establish, clearly, the impact of outbreaks such as COVID-19 on educational programmes and activities across the globe.
- The specific management problem is the inability of international bodies such as the World Health Organisation and economies like China to draw on their respective medical personnel and technological sophistry to detect early to prevent degeneration of the epidemic into pandemic. Other specific management problems are the inability of less-endowed economies to acquire and install state-of-the-art medical equipment to assure effective treatment of infected and potential COVID-19 patients; and the inability of medical experts across the globe to develop quickly the type of vaccine or vaccines needed to cure infected patients; prevent further spread of the pandemic; and to assure non-interruption in educational activities and programmes across the globe. The present study sought to examine how the COVID-19 pandemic could disrupt educational activities and programmes in countries and territories across the globe.

1.3. Research Objectives

1.3.1. General Objective

The main purpose of this research was to examine the effect of the COVID-19 pandemic on successful implementation of academic programmes and activities in countries and territories across the globe.

1.3.2. Specific Objectives

Specifically, the current research sought to achieve the following objectives:

- Evaluate the extent to which epidemic and pandemic outbreaks disrupt academic programmes in countries and territories across the globe.
- Assess the effect of epidemics and pandemics on education of the vulnerable in society.
- Examine how total learners' population could potentially influence spread of epidemics and pandemics among total national population.
- Make recommendations to improve on global adaption of information technology sophistry by public and private institutions to facilitate the implementation of uninterrupted academic programmes and activities during epidemic and pandemic outbreaks.

1.4. Conceptual Definitions

For the purpose of this research, *learners* referred to infants, children and adults enrolled in academic institutions from pre-primary through tertiary levels in any given jurisdiction. *Learners' ratio* referred to the proportion of total learners' population (tlp) to the total national population (tnp) of a given country multiplied by one hundred per cent ($(tlp \div tnp) \times 100\%$). To illustrate, Ghana's estimated total learners' population during the period was 9,696,756 while the total national population during the same period was equivalent to 31,072,940. This translated into *learners' ratio of 31.21%* ($(9,696,756 \div 31,072,940) \times 100\% = 0.3120643 \times 100\% = 31.20643 = 31.21\%$) for Ghana during the period.

Further, the terms, *COVID-19* and *Coronavirus* were used interchangeably with the same underlying meaning. That is, the new virus believed to have originated from Wuhan City in Hubei Province in the People's Republic of China; and later spread into many countries and territories across the globe. The phrases, *case fatality rate*, *case fatality ratio*, *rate of death*, and *death rate* were used interchangeably with one underlying conceptual meaning. That is, the proportion of deaths relative to the total number of confirmed COVID-19 cases during a given period. This was consistent

with Harrington's (2020) epidemiological definition of case fatality rate or ratio. Finally, the term *Instructors* referred to teachers, tutors and lecturers from pre-primary through tertiary levels.

2. Literature Review

The main topic underlying the current study was the 'Impact of the Coronavirus Pandemic on Global Education.' The main objective of this study was to examine how the rapid spread of COVID-19 could have severe adverse implications for the successful implementation of academic programmes and activities in individual countries and territories; and the ultimate effect on widespread education across the globe. This section presents a synthesis of literature related to the research. Stated differently, this section presents a review of related and existing works in the study area. In scientific inquiries, it is imperative to identify relationships between the research problem and reviewed literature on one hand; and between the research objectives and reviewed literature on the other. It was incumbent on the researcher to ensure these relationships are apparent; and this is evidenced in the present study. The main question that anchored the current research was: 'What are the impacts of the COVID-19 outbreak on academic programmes and activities in individual countries and territories across the globe?'

Data required for the conduct of the current research were obtained from text books, peer-reviewed articles published in journals, research papers, newspaper publications; Google Search Engine including worldometers.info, africanews.com, ghanahealthservice.org, who.int, and weforum.org; and electronic databases of international bodies such as the United Nations Education and Scientific Cultural Organisation (UNESCO), among other significant sources. The subsequent key words and phrases were used to generate relevant information and data from the Google Search Engine and other relevant databases: Coronavirus, COVID-19, updates on COVID-19, effect of COVID-19 on global education, and school re-opening strategies. Discussions in this section are preceded by a theoretical framework.

The following sub-themes formed the basis for extended discussion in this section: Median duration of school closures; adaption of measures to mitigate pandemic effects; impact of extended school closures on retention rate; effect of pandemics on instructors and families; institutional response to pandemic challenges; challenges to education of the vulnerable during pandemics; and estimated cost of school closures. Discussions in this section contributed significantly to the research objective that is, identifying the level of preparedness and responsiveness of countries and territories across the globe against the threats of COVID-19 to minimise its sporadic impact on global education.

2.1. Theoretical Framework

The academic luminary, Herbert Spencer, who lived from 27th April, 1820 to 8th December, 1903 remains one of the doyens of sociological development and advancement across the globe. The seminal works of Herbert Spencer included the *theory of social evolution*. This is arguably his most significant contribution to the field of sociology. Thus, *Spencerism* is believed to be nucleated around the *law of evolution* or the *evolutionary doctrine* (Cosser as cited in Priya, n.d.). The following chronological publications added to Herbert Spencer's contribution to the field of sociology: *The proper sphere of government* (1843); *Social Statics* (1851); and the *Social Organism* (1860) (Offer, 2019). Indeed, Herbert Spencer's contribution to the sociological field was not limited to the foregoing publications. As noted elsewhere, his social evolutionary theory is pivoted around two sub-protagonist themes: biological evolution and physical evolution. The phrase, 'Survival of the fittest,' was first coined and introduced by Herbert Spencer (New World Encyclopedia, 2017). This phrase later formed the basis for Charles Darwin, the naturalist's popularity, following his publication in 1859 entitled *On the Origin of Species* (Offer, 2019). The underlying principle of Spencer's biological evolution posits, in ever-changing environment or circumstances, it is only creatures or humans who demonstrate finesse, agility; and are able to make effective adjustments with relative ease, that would be assured of survival in their persistent struggle for existence. However, for the purpose of the current research, we emphasised on *physical evolution*.

The underlying concepts of physical evolution hypothesise societal activities are characterised by movement from homogeneous to heterogeneous, and from simple to complex arrangements. The emphasis on heterogeneity is borne out of the instability inherent in homogeneous social settings. Generally, physical evolution emphasises a paradigm shift from indefinite and incoherent social arrangements to definite and coherent social settings (Priya, n.d.). Spencer (as cited in Priya, n.d.) argued evolution occurs when motion is dissipated paving way for the integration of matter. During this process, matter is believed to transition from a state of incoherent and indefinite homogeneous environment to coherent and definite heterogeneous settings. The eventual motion that is sustained and retained is subject to a parallel transformation. Spencer (as cited in Priya, n.d.) shared all occurrences in the world have causal relationships and could be traced to two underlying factors. He believed these factors form part of the theory of force and include motion and matter. Spencer (as cited in Priya, n.d.) advanced three basic laws and four secondary propositions within the context of universal evolution. These include the law pertaining to persistence of force, law of indestructibility of matter, and the law of continuity of motion. In the *first law*, Spencer (as cited in Priya, n.d.) averred force or energy is not increased during the process of evolution. This means force or energy always persists. The persistence of force makes it very influential in evolution; force is the main cause or driver of evolution. However, it is not affected by the process of evolution. The *second law* asserts matter cannot be destroyed. Matter has been identified as an aspect of energy that could seldom be destroyed. Stated differently, it is difficult to destroy matter, though it may be susceptible to formal transformations. The modifications that are witnessed in the shape of matter account for the evolutionary process it undergoes. The foregoing notwithstanding the elementary nature of matter remains intact, and not susceptible to any changes. The fundamental elements of energy and matter found in the world are not created, neither are they destroyed. Rather, these elements are preserved. The *third law* argues motion is continuous and never dissipated in whole albeit, some transformations occur in

the form of motion. This law emphasises on stages in the process of evolution; and asserts all things in the world continue in motion. Thus, the globe is characterised by motion in perpetuity.

The four secondary propositions postulated by Spencer (as cited in Priya, n.d.) were couched as follows: relationship between identified forces is persistent; social arrangements are characterised by formal changes and uniformity; there are greatest attractions and least resistance; and there prevails gradual motion. The basic principle underlying the *first proposition* is the harmonious relationship among all laws. That is, it is imperative for a harmonious relationship to be established among all laws of evolution in the world; contradiction should not be observed between two laws; defined phenomena must share uniform and regular relationships; and the world must comprise an order of elements. The *second proposition* affirms the need for changes to be formal and uniform; and that, matter and motion are not utterly destroyed in the evolution process, they only subject themselves to some changes in form. However, the amount of motion and matter is not affected by the formal change; it remains intact; the rudiments of matter, motion, and force are not lost during the change process. Rather, they are transformed and reappear in the form of other events. In the *third proposition*, Spencer (as cited in Priya, n.d.) noted evolution is always directed towards the lines of greatest attractions and least resistance; all elements and forces prefer to navigate along the lines of greatest attractions and least resistance. This proposition resonates with the popular maxim which states 'the animal prefers to prey on friendly grounds, and not on hostile ones.' To wit, evolutions of force and matter characterised by challenges may be rejected. Instead, the evolution would be redirected towards paths of greatest attraction (joy) and minimal resistance (peace). The *fourth proposition* underscores the significance of motion in evolution, and the need for the motion to be gradual. This proposition does not support the call for motion to remain at the same level at all times; motion may occur at a fast or slow pace. The movement of development and duration among natural phenomena occurs at different rates, and based on varying rhythms. Spencer (as cited in Priya, n.d.) asserted it is self-evident that all parts of the universe, be it social or non-social, organic or inorganic, ascribe to natural evolutionary laws.

Spencer (as cited in Priya, n.d.) was of the firm conviction the identified phenomena of nature, including the sociological and psychological processes of individual experiences, phenomena of the earth and terrestrial, development of species, and biological organisms, amongst others, ascribe to specific pattern of transformation. Increasing differentiation and diversity is set into motion once society begins to witness diversity and differentiation. The increase in differentiation and diversity is cumulative. The diversity society witnesses feed on itself and over time creates room for increased complexity. Spencer (as cited in Priya, n.d.) observed the pool of different units into an aggregate creates room for specialisation; this allows parts that are different to respond to stimuli differently, and those that are similar to respond in the same way. Further, all natural phenomena pursue an adjustment process until a moving equilibrium is attained. Finally, human evolution is subject to dissolution. That is, the evolution process is reversed at a point in time; and all phenomena succumb to this process.

2.1.1. Relevance of Spencerism in Contemporary Periods

Today, the pace of evolution among some societies across the globe is very rapid while others tarry in the process. There are societies today that have evolved significantly and are pace setters in the global quest for socio-economic transformation through improved educational systems. This category of societies finds expression in Spencer's (as cited in Priya, n.d.) definition of complex society. Examples of social communities in this group are the advanced economies. Conversely, there are societies today that are deeply-rooted in Spencer's (as cited in Priya, n.d.) definition of simple society with little socio-economic progress and remote, in terms of migration to the complex evolutionary level. Examples in this category are poor or least developed economies. However, many developing and most emerging economies are inching close to the complex evolutionary level.

As society evolves and population increases, the globe is saddled with a major phenomenon that ostensibly holds the key to current and future civilisation. That is, the provision of quality, accessible, affordable and uninterrupted education. However, social evolution coupled with increased environmental challenges such as the occurrence of pandemics undermines the realisation of set educational objectives of many societies across the globe. As Spencer (as cited in Priya, n.d.) noted, the process of transformation from simple to complex evolutionary systems should have minimal effect on matter and motion, two important factors of force. Stated differently, it behoves modern or complex societies to ensure natural occurrences such as epidemics and pandemics have little or no adverse effect on planned educational programmes and activities across the globe.

2.2. Median Duration of School Closures

An empirical study conducted by Markel, Lipman, Navarro, Sloan, Michalsen, Stern et al. (2007) among forty-three (43) cities in the United States to ascertain their response to the Spanish flu pandemic revealed median duration of school closures during the period was four (4) weeks; school closures reduced morbidity rate from the Asian flu outbreak of 1957 through 1958 by about 90% (Chin, Foley, Doto, Gravelle & Weston, 1960) while the effect of school closures on morbidity reduction during the 2004 through 2008 influenza outbreak in the United States was estimated at 50% (Wheeler, Erhart & Jehn, 2010). However, the magnitude and speed of spread of the foregoing pandemics do not compare with those of the COVID-19 pandemic. Thus, the median duration of school closures during the current pandemic outbreak may differ.

Another pandemic that ravaged the global economy and disrupted educational activities was the Swine flu recorded from 2009 to 2010. Extant research (Simon, 2020; Kawano & Kakehashi, 2015; NIH, 2011) revealed economies that implemented school closures as part of their non-pharmaceutical interventions were able to mitigate the spread of infections. The peak of the Swine flu pandemic in the United States was delayed due to decisions to close down schools early. Overall, the success rate of school closures in the United States during the period was found to be high although the

reaction to school closures at the district level in Michigan was found to be ineffective. At the peak of the Swine flu pandemic outbreak, decision by authorities in Oita, Japan, to close down schools decreased the overall number of infected students in the city albeit, the decrease in rate of infection among students was found to be insignificant. The foregoing notwithstanding, transmission rates of influenza were reduced in the range 29% - 37% following the strict implementation of physical distancing orders and school closures.

Scientists in the United Kingdom (UK) found closure of schools during the Swine flu outbreak in the country as appropriate for several reasons. These included interruption in the course of the infection, slowing widespread of the pandemic; and having ample time for research and eventual production of requisite vaccine or vaccines for effective cure of the pandemic. The scientists drew on experiences from prior studies on pandemics (Spanish flu of 1918 through 1920; Asian flu of 1957 through 1958; and Hong Kong flu of 1968 through 1970) to examine the dynamics of spread of pandemics during school holidays in France. The research outcomes revealed a positive relationship between school closures and lower reported cases; the number of confirmed cases increased when schools re-opened in the midst of the pandemic. The findings revealed during the flu season (1999-2000) in Israel, teachers embarked on strike. This helped to reduce visits to doctors by more than one-fifth (1/5); and reduced respiratory infections by more than two-fifths (2/5) (Murray, 2009; Walsh, 2009).

Rana (2020) discussed strategic ways in which key stakeholders could plan to ensure equity among the global learning population during the period of school closures emanating from the COVID-19 pandemic. Rana (2020) argued daily activities of children help them to maintain strong immune systems. Further, school closures could have psychological effects on learners, especially students at the 12th grade level who were due for graduation. Due to the foregoing, Rana(2020) believed schools across the globe should have remained open, irrespective of the prevalence of the COVID-19 pandemic; and urged various countries to adapt the Taiwanese functional model, which included allowing people to go about their normal lives and activities without closing down schools and stalls in Taiwan. However, Onkpar (2020) thought otherwise; the author believed any attempt to restore academic activities in various jurisdictions should commence at the tertiary level where learners are presumed to be mature enough to observe and implement the preventive measures and protocols outlined to curb further spread of the pandemic. Onkpar (2020) noted the ability of tertiary-level learners to individually and collectively act in consonance with preventive protocols could not be doubted; the success rate may be high. Subsequently, the rate of success of the implementation at the tertiary level would inform gradual extension to include learners at the secondary, primary, and pre-primary levels. Wakara (2020) affirmed the need for various governments that mooted the idea of school closures to be thanked unconditionally for taking that giant step to save the lives of learners in their respective jurisdictions; and across the globe. Thus, Wakara (2020) perceived school closures as an appropriate non-pharmaceutical tool for containment; and prevention of further spread of the COVID-19 pandemic. However, Wakara (2020) shared in views that called for various governments' adaption of the right approach to minimise the adverse impact of COVID-19 on education.

2.3. Adaption of Measures to Mitigate Pandemic Effects

Chang and Yano (2020) noted evolution of the COVID-19 pandemic compelled affected countries and territories to adapt multiple approaches to mitigate its ominous impact on learning in particular, and on education in general. The authors indicated policies required to stem the negative tide of the Coronavirus pandemic on learning transcended modalities identified to be rolled-out on distance learning. These modalities included measures intended to address the social dimension of the COVID-19 crisis. Further, socialisation, including face-to-face interactions among learners, between learners and instructors, and sporting activities was found to have 'eluded' learners and instructors following prolonged school closures emanating from outbreak of the Coronavirus pandemic. However, in some cases, the 'lost' socialisation in some schools was redirected to other schools albeit it intensified pressure on existing facilities in those schools. As an example, UNESCO (2020a) shared in some cases, not all schools are closed following the outbreak of an epidemic or a pandemic. In such situations, undue pressures are brought to bear on localised schools that remain open. Thus, governments and parents may redirect learners to schools that remained open during the COVID-19 period; these may result in overcrowding and strain the limited educational facilities available in those localised areas.

Hakeem (2020) expressed surprise at measures adapted by the Washington State in the United States of America (USA) to ensure equity among the learning population during school closures. During the COVID-19 outbreak which necessitated school closures, provision of online learning services in the state was predicated on the schools' ability to assure learners of equitable access. Hakeem (2020) quizzed: 'Is the inequality or disparity in access so stark and difficult to address that online learning services are not offered at all by some schools?' (para. 1). Further, Hakeem (2020) sought to know the implication of the online learning services policy for disruptions in education during the pandemic period; conditions under which schools could be certain that equitable access has been assured; and whether equity implied ensuring equal opportunity and access to online or distance learning were available to all. He believed equity could be assured through the printing of assignments for learners with no access to computers or Internet or both; through provision or lending of computers to learners from deprived or low-income families; and through subsidies on telecommunication and mobile data packages. Hakeem (2020) believed the identification of practical and helpful solutions could ensure effective delivery of educational services at all levels while mitigating the adverse effect of the COVID-19 pandemic on the entire economy. Nisha (2020) held that effective and implementable online learning arrangement would ensure efficiency and collaboration between learners and instructors; and enhance sincerity among key stakeholders in education.

One of the greatest challenges posed by epidemics and pandemics is the inability to collect reliable data on education during the period. The GEM Report (2020) revealed questions related to the potential effect of the Coronavirus

pandemic on education may arise in the short-, medium-, and long-term. In the interim, the focus may be on understanding how key stakeholders such as instructors, students, and parents could be supported to mitigate the overall effect of school closures on everyone with emphasis on the most vulnerable. In the medium- and long-term, it would be essential to assess the effect of school closures on professional career and beyond; and to assess the progress of various economies towards the United Nations (UN) Sustainable Development Goal (SDG) targets for 2030. Effective analyses of the foregoing trend in the next two to three years to determine the functionality of the current implementable measures, and which ones need to be reviewed would be contingent on the availability of reliable data.

Reliable data would facilitate the development of framework that would provide the needed support and assistance to deserving communities and countries over the next decade. However, the GEM Report (2020) noted the impact of extended school closures on children vary; the impact may be different for children in the middle of their academic education, those in their final year, and children who are about to start schooling. Tarasawa (2020) averred the availability of reliable, accurate and valid data could be very useful during periods of uncertainty and disruptions; the data would be essential when policymakers are obliged to make definitive decisions on resource allocations, and decisions on how best to provide academic assistance to learners.

Institutions of learning at various levels serve as hubs of human interaction and social activity. Physical school sites afford learners the opportunity to engage in face-to-face interactions, improve on social relations and contacts; and to enhance their academic and personal development. Forceful school closures emanating from predatory pandemics such as COVID-19 compel learners to indulge in social and physical isolation (UNESCO, 2020b). This affects the psyche and social development of children. However, the inevitability of the occurrence of epidemics and pandemics consistently affirms the need for social adjustments to the dynamics introduced to the earth, and countries and territories therein by natural disasters. Some of these dynamics include strong considerations for the implementation of distance and online learning in academic institutions in each country and territory across the globe.

Shaeffer (2020) acknowledged significance of the multiplicity of measures adapted by various countries and territories to ensure containment; and to minimise eventual effect of the COVID-19 pandemic on their respective economies. However, Shaeffer (2020) bemoaned the muteness of most of these interventions on early childhood education and care. In other words, most government interventions did not spell out clearly arrangements made for early childhood education and care during early stages of the pandemic. UNESCO (2020c) identified gaps in child care as one of the challenges associated with school closures globally. This increases absenteeism as some parents are compelled to stay at home to cater for their under-aged children. The foregoing holds when there are no alternative arrangements for care givers; and this affects wage earnings, productivity and output. This notwithstanding, some advanced, emerging, and developing countries took the necessary steps to arrange for early childhood education and care for the wards and children of security personnel and medical staff to avoid disruptions in their valuable contributions to the collective fight against the COVID-19 pandemic.

Most countries and territories across the globe have internal and external or regional examinations such as the General Certificate of Education, Ordinary and Advanced levels (GCE 'O' and 'A' levels), Junior High School (JHS), Senior High School (SHS), SAT, GMAT, TOEFL, ACCA, ACA, and others, that help in determining the admission and advancement of learners to new academic institutions and levels. However, successful organisation of the foregoing examinations become a challenge during epidemic and pandemic outbreaks when school closures, physical and social distancing are identified as some of the effective ways of curbing further spread. The examination bodies are compelled to postpone or cancel most of these examinations during school closures arising from epidemic and pandemic outbreaks. UNESCO (2020b&c) noted the issue of fairness comes to play when examinations that were hitherto taken onsite are organised online for students; and disengagements among students may increase when they study without examinations or assessments over a given period. The GEM Report (2020) doubted the ability to measure effectively the impact of cancellation of examinations and temporary disruptions to academic programmes on sustainable education in communities and countries across the world, owing to the challenges associated with gathering reliable data from respondents.

2.4. Impact of Extended School Closures on Retention Rate

Protracted school closures may affect retention rate among school children; it may encourage high drop-out rates in communities and countries where the school children or students work to earn a living or to support their respective families or both (UNESCO, 2020a&c). In some cases, the school-going child may not be under the economic obligation of his or her parents or caregivers to work to earn a living, but may do so voluntarily; and end up being enticed by regular monetary rewards during the period. By comparing the monetary rewards from working with the non-monetary gains from active schooling, some learners may opt for the immediate economic or financial benefits from working in place of an education which could define their future career and assure them of decent earnings and living standards in the medium- and long-term.

Atchoarena (2020) shared the UNESCO Global Network of Learning Cities (GNLC) comprises one hundred and seventy-three (173) member countries; and each of these member countries was saddled with greater challenges following the outbreak of the Coronavirus pandemic. The challenges notwithstanding, the UNESCO-GNLC member countries demonstrated strong commitment to lifelong learning; and exhibited innovativeness in their respective and collective fight against the pandemic. Tarasawa (2020) posited a strong collaboration among school authorities, researchers, and policymakers was fundamental to understanding and identifying potential policies and best practices that could lead various countries and territories, and their respective schools to recovery. Collaborative research with schools would help to unravel effectively, the outcome of school closures on learning capabilities and progress of the learners'

population; determine the generalisability or otherwise of the research outcomes; and to define possible schools' recovery policies that could be extended and adapted nationally for implementation in a timely manner.

More than half of the global estimated population of 7.8 billion people reside in cities and the adjoining urban areas. The COVID-19 pandemic outbreak compelled more than 90% that is, about 1.63 billion of the world's total learners' population to remain in their respective homes. To ensure academic programmes continued uninterrupted, ministries of education in various countries were burdened with the task of making alternative arrangements; and providing alternative learning solutions for learners and instructors. Atchoarena (2020) noted the effect of these novel arrangements was mostly felt at the local level. This is attributed largely to the adaption and implementation of decentralised systems in many jurisdictions. Since more than half of the global population is found in urban areas, Atchoarena (2020) believed cities have a significant role to play in the formulation of policies and measures aimed at ensuring learners consistently have access to education through online or distance learning; and to ensure this opportunity is extended to vulnerable learners in deprived homes and communities. This responsibility notwithstanding, the author identified cities as critical actors in the global fight against COVID-19: 'Everywhere in the world, cities are on the frontline of the fight against COVID-19, from managing overstretched health and social services to coping with the closure of learning institutions' (para. 2). It is the responsibility of cities to transform various schools; and to avoid interruptions in planned learning programmes and activities. Beyond the foregoing, cities are tasked to ensure total transformation of lifelong learning systems into a massive preventive resource.

Most students at the secondary level are at their adolescent stage. In some societies, female adolescents are 'due' for marriage, especially customary marriage. Thus, prolonged school closures without definitive re-opening dates create the opportunity for some parents to arrange early marriages for their female adolescents. During school closures, teenage pregnancies may be rife while sexual exploitation and forceful recruitment of children and adolescents into militias may be rampant (UNESCO, 2020a). The foregoing corroborates Giannini and Albrechtsen (2020) who found school closures in over one hundred and eighty-five (185) countries as a potential for entrenchment of the existing gender gaps in education. The authors noted school closures have the potential for high school drop-out rates, especially among adolescent girls. School closures have the potential for increased risk of sexual exploitation, early and forced marriages, early and teenage pregnancy, among other potential setbacks to planned and systematic education of girl adolescents across the globe. The authors noted refugee camps affected by COVID-19 would have adverse impact on the education of girls.

Giannini and Albrechtsen (2020) indicated refugee girls enrolled at the secondary level are only half as likely to enrol as their male counterparts. Globally, our understanding and appreciation for the economic effect of the Coronavirus pandemic is progressive. This notwithstanding, the effects, especially for girls and women are envisaged to be devastating and widespread. The authors revealed in the Global South, social protection measures put in place by respective governments are limited in scope. Therefore, economic hardships created by the Coronavirus pandemic are likely to have spill-over effects; the opportunity costs of providing education for girls would be considered strongly by families. Schools across the globe were expected to re-open when the number of reported cases and deaths reduce; and countries improved considerably on the containment measures. Although many girls would continue with their education in the post-COVID-19 period, Giannini and Albrechtsen (2020) feared others would not be able to return. As a result, responses to educational desiderata must prioritise the urgent academic needs of girls, so the significant gains made in promoting girl-child education over the last twenty (20) years would not be lost or futile.

2.5. Effect of Pandemics on Instructors and Families

Aulo (2020) noted the implementation of non-pharmaceutical interventions such as lock downs and school closures compel families to remain indoors; and this brings in its wake some challenges to the affected families. Aulo (2020) believed family issues emanating from the non-pharmaceutical interventions enumerated in the preceding section could be addressed through the provision of nutritious meals to minimise the high incidence of malnutrition; and to minimise the effect of increasing prices of food items on families' total demand for food and other goods. This corroborates UNESCO (2020a&c) who found a positive relationship between compromise on nutrition and school closures; and further found the tendency for many school children to eat healthy and nutritious foods during school closures is low; most children rely on free and discounted meals provided by their respective schools; this service may be compromised during school closures thereby affecting their nutrition levels; and affect their ability to eat three square meals on a daily basis. Further, the necessary steps must be taken to ensure rigorous development of electronic learning (e-learning) at all levels of the education strata while medical services delivery including pre-natal, post-natal, and self-test kits for COVID-19 are brought to the door steps of affected families. Family members who test positive should be rushed to the nearest medical facility for treatment. However, UNESCO (2020b&c) noted increasing demand for new online learning tools and pressure on existing facilities during school closures. It is believed both human and technical challenges are encountered when the need for transition from classroom learning to online learning becomes necessary and at full scale. Setting up computers, Internet and other equipment to facilitate distance learning from homes becomes a challenge to many families during school closures and lockdowns.

UNESCO (2020b) found a link among teachers, stress and confusion during school closures, especially when the closures are unanticipated and without definite periods. Unspecified school closure periods affect teachers' ability to remain organised; know their obligations; and to maintain contacts with students to support learning. School closures affect sustainability of employment of many instructors in private institutions while transition to online learning platforms tends to be challenging.

Mutea (2020) noted steps taken to train caregivers and parents during the lock down period were in the right direction. This allowed caregivers and parents to sharpen their skills to effectively engage learners during school

closures. Mutea (2020) recounted the trauma experienced by Kenyan parents from the government's decision to close schools indefinitely culminating in long stay of their wards and children at home. Mutea's (2020) submission was supported by UNESCO (2020c) who noted parents, especially those with limited education and resources struggle to cope with the task of facilitating learning of their children and wards at home during school closures. Chang and Yano (2020) averred the protracted school closures called for mental health and protection of well-being of learners; and provision of the requisite support to instructors, parents and caregivers. This would ease the negative socio-economic effect of the COVID-19 pandemic on the foregoing stakeholders or victims.

2.6. Institutional Response to Pandemic Challenges

Atchoarena (2020) averred institutions characterised by lifelong learning are often called upon to promote habits, behaviours and gestures that could contribute meaningfully to the prevention of contamination. The COVID-19 pandemic has necessitated the prioritisation of health education for school children, students, citizens, and residents of various global countries and territories. Generally, the authority, funding, experience, and expertise of key stakeholders from the private and public sectors, and civil society organisations are pooled together in cities to provide the requisite assistance at the local level. These stakeholders complement, implement, and support governments' measures aimed at responding to and preventing further spread of the pandemic while incorporating lifelong learning as strategic goal and means. Assisting in the establishment of online and distance learning platforms was not without challenges. For instance, stakeholders were confronted with the following: difficulties in assisting instructors to ensure effective implementation of the online learning devices; challenges to ensuring Internet connectivity for those with no access at home; and problem of monitoring and assessing periodic and overall learning outcomes, among others.

Diop and Jain (2020) assessed the impact of COVID-19 on the Indian educational system; and described the pandemic as a global enemy that is mighty and invisible. The authors noted the advent of COVID-19 brought socio-economic activities in prosperous western countries and the Indian economy to an excruciating halt. Diop and Jain (2020) were concerned about the preparedness of the Indian society for the discipline and empathy required to ensure effective implementation of social and physical distancing rules and orders. They noted an effective implementation of social distancing rules did not only depend on an individual but also on all other people around him or her; and that, the discipline of others helps to minimise further spread of the pandemic. The slightest error committed by one person during the pandemic period could prove fatal for an avalanche of persons. Diop and Jain (2020) argued COVID-19 brought in its wake a crisis that compelled an individual's welfare to be dependent on his or her neighbour next door. However, this dependence would not end with the passage of COVID-19; similar epidemics and pandemics in the near and distant future would warrant such interdependence among individuals and neighbours.

A study conducted by Brainwiz (as cited in Diop and Jain, 2020) revealed the abrogation of Article 370 led to some disruptions in academic programmes and activities in schools across India. The research revealed loss of more than sixty (60) working days in schools across Kashmir and Jammu while one hundred and twenty (120) productive days were lost in states such as West Bengal, Punjab, Delhi, and Puducherry due to pollution levels and extreme weather conditions. The estimated number of days lost from political rallies and other activities was thirty (30) days. However, Diop and Jain (2020) asserted these disruptions were 'local and limited' in nature; and under the control of Indian authorities. For instance, the disruptions in Kashmir and Jammu did not affect academic activities in Karnataka. Similarly, students in Nagaland attended classes regularly when schools in Delhi were closed due to severe air pollution. However, what makes COVID-19 very predatory is its failure to create room for any safe havens; all states and localities in India were equally at risk of contracting the COVID-19 virus. This rendered the Indian government's preparedness and social awareness programme for the citizenry very crucial; communities were educated on the 'dos' and 'don'ts' that would prevent further spread and assure containment of the COVID-19 virus.

Diop and Jain (2020) sought to determine whether Indians were conditioned, mentally, to face challenges emanating from pandemics such as COVID-19; and whether the prevailing educational system in India has value systems which engender discipline, compassion and empathy for public welfare. The primary response of Diop and Jain (2020) to the foregoing statements was not in the affirmative; the evidence pointed to the contrary. In affirming the possible recurrence of future pandemics and the need for improved preparedness and responsiveness, Diop and Jain (2020) noted: 'COVID-19 will not be the last such aggregate shock. By not focusing on skills aimed at sustainable cohabitation, we have already produced several generations of adults who may not be psychologically equipped to deal with such challenges' (para. 9). The onus, however, lies on society to churn out subsequent generation of community leaders who could think for themselves; and effectively address issues around them. Indeed, COVID-19 had set the pace for such generational leadership challenges.

2.7. Challenges to Education of the Vulnerable During Pandemics

Giannini and Albrechtsen (2020) argued the magnitude of the Coronavirus pandemic is unprecedented. However, effective lessons from the Ebola outbreak in Africa could serve as a guide; and provide the requisite roadmap towards containment and recovery from COVID-19. The Ebola pandemic outbreak in 2014 strongly affected African countries such as Sierra Leone, Guinea, and Liberia. More than five million learners were affected by school closures in Sierra Leone, Guinea, and Liberia during the period. The Ebola outbreak did not only result in school closures, but also led to increased poverty levels in the affected countries. Expectedly, the Ebola outbreaks created socio-economic challenges which led to increased school drop-out rates. Some of these challenges included sharp rise in domestic and caring responsibilities; and the pressing need for some of these learners to engage in income generation activities to support themselves and their immediate families. The foregoing responsibilities limited girls' ability to learn effectively at home. However, the

establishment of *girls' clubs* in some villages coupled with sensitisation efforts to promote girl-child education are expected to minimise the adverse effects; and to promote learning among girls to improve on their competitiveness and enhance their overall academic success rate across the globe.

Tarasawa (2020) catalogued various interventions adapted by governments, school authorities, and families in some jurisdictions to counterbalance the disruptions in academic programmes by the COVID-19 pandemic. These included the implementation of online curricula; online academic instructions (interactions between instructors and learners in virtual classroom environments); and availability of resources to monitor progress. In spite of the tremendous efforts to mitigate disruptions, academic projections for the vulnerable remain lower owing to chronology of factors such as death or illness of a loved one, domestic violence, joblessness, trauma, increase in number of families in food insecurity 'net,' and homelessness, among others.

Some adolescent girls perceive education as a lifeline; education protects adolescent girls from exploitation and violence; and provides the requisite skills and hope for brighter and prosperous future. Given the magnitude of the COVID-19 pandemic in certain jurisdictions, some schools were closed indefinitely. However, Giannini and Albrechtsen (2020) believed significant lessons from the Ebola and other pandemic outbreaks could guide practitioners and policy makers in the implementation of measures to address challenges saddled with adolescent girls in their academic pursuits during the COVID-19 crises; and during future pandemics. The authors argued various governments could protect the gains thus far made in the education of the girl-child by emphasising inclusive methods of distance learning to assure continuous investment in the education of girls. Inclusive methods relate to governments' ability and resolve to work in concert with communities, instructors, and academic staff. Adolescent girls' education could be enhanced when communities are sensitised on the socio-economic importance of promoting and encouraging girls to pursue further academic studies through on-site or distance learning or both.

Giannini and Albrechtsen (2020) posited challenges associated with the education of girls could be improved through the adaption of the right distance learning practices. That is, it is imperative for governments and other key stakeholders to consider the adaption and implementation of gender-responsive and low technology approaches in situations where access to digital solutions is uncommon to targeted learners. The identified approaches include allowing learners to take writing and reading materials home; ensuring the most marginalised are reached through the use of television and radio broadcasts; and assuring flexibility in the programme and learning structure, so girls who are tasked with extra house chores and care would not be disadvantaged and discouraged from participating in distance and online learning. In some cases, access to the Internet to facilitate online and distance learning may not be readily available. In such situations, the authors believed adolescent girls must be provided the requisite training in digital usage to increase the knowledge and skill needed to remain safe online.

Social protection and school meals are two of the numerous essential services that elude the most vulnerable, children, youth, and girls during school lockdowns. To minimise the devastating impact of school lockdowns on the aforementioned category of learners, Giannini and Albrechtsen (2020) called for the arrangement of alternative social services; transformation of schools into access points for psychosocial support and food distribution; and working across various sectors to ensure delivery of support through text messages, telephone interaction, and other media, to affected learners. The authors held that based on the needs and experience of adolescent girls, it is imperative for them to be included in the development of strategies and policies intended for school closures and distance learning. Thus, involving adolescent girls in decisions related to their education is vital to their successful academic development; and assurance of decent standards of living in the near and distant future.

UNESCO (2020a) affirmed high socio-economic costs of school closures for individuals in various communities across the globe. However, school closures have far reaching consequences for the most marginalised and vulnerable girls and boys and their respective families. School closures do not only worsen already existing gaps in the education system but also worsen challenges in other aspects of lives of the vulnerable and marginalised. UNESCO (2020a) believed one of the consequences of school closures is the interruption in pre-programmed learning activities in various schools. Academic programmes including learning and recreational activities provide the opportunity for development and growth of learners, especially for under-privileged learners who have limited development and growth opportunities outside the school. Lack of access to learning and recreational activities due to pandemic outbreaks affects the development and growth of under-privileged learners.

Giannini and Albrechtsen (2020) averred more girls would return to school during re-opening if stigmatisation and discriminatory school laws are relaxed. The authors argued the resolution to relax discriminatory school laws would allow pregnant girls to continue with their education in post-pandemic periods. Identifying challenges – financial and social - associated with girl-child education and taking the necessary proactive and reactive steps to address same are pivotal to increasing their access to formal education; and enhancing their chances of success in life.

Tarasawa (2020) collaborated with Megan Kuhfeld to examine the effect of school closures emanating from the Coronavirus pandemic on the academic achievement of learners from the third through twelve grades. The study involved comparative analysis of typical school year with no disruptions in the academic calendar and two possible outcomes from school closures. One is *COVID-19 slowdown* which the researchers defined as the possibility of learners maintaining the same level of academic achievement, they possessed prior to school closures from 15th March, 2020 till school re-opens. The other is *COVID-19 slidewhere* learners exhibit signs of learning loss throughout the extended school closure period, which Tarasawa (2020) described as an academic achievement characteristic of summer learners. The findings revealed a commonality between the Coronavirus pandemic and summer break; preliminary assessment showed when learners return to school, the impact of the pandemic on mathematics would be greater than on reading; some learners would maintain less than 50% of their academic capabilities while others may be almost a full academic year behind their peers.

To address the simmering challenges, Tarasawa (2020) called on the education community and policymakers to provide support, especially in the area of mathematics for learners when schools' academic programmes are disrupted by epidemics, pandemics, and other natural disasters.

Minnich (as cited in Tarasawa, 2020) affirmed the need for key stakeholders in education to enhance their efforts aimed at narrowing existing opportunity gaps by mitigating the adverse effect of the Coronavirus pandemic on children; and on segment of the global population that is most vulnerable. Tarasawa (2020) argued the classroom would be 'a changed landscape' (para. 1) when administrators, students, and educators return to schools after the school closures emanating from the Coronavirus pandemic. The author predicted the modified classroom landscape would be characterised by persistent economic challenges for families that are marginalised; there may be higher equity gaps; and substantial learning loss for a significant number of learners may be recorded. Jenkins and Chanduvi (as cited in UNESCO, 2020b) bemoaned the negative implications of long school breaks for the marginalised. They believed the probability of marginalised learners returning to school after a long break may be low; and that, the need and decision to re-open schools are not exclusive to education ministers and their key stakeholders and policymakers; the COVID-19 pandemic is a major threat to the general public. Thus, the decision to re-open schools requires fundamental assessment of the health implications; and how the attendant risks could be mitigated.

The Northwest Evaluation Association (NWEA) (as cited in Tarasawa, 2020) estimated the likely effect of the Coronavirus pandemic on learners' achievement levels. The study included over five million learners who participated in MAP Growth assessment tests. The participants were drawn from grades three through eight. The research findings revealed school closures could impact severely on academic achievement levels; learners are likely to record significantly lower achievement levels during the period. Tarasawa (2020) noted the difficulty in adequately measuring the potential impact of school closures over given months on learners' achievement levels. However, outcomes of empirical research on loss from summer learning and seasonal learning could prove valuable to families, educators, and policymakers when developing strategic plans to mitigate the potential adverse effects of extended hold-ups in classroom learning; and the potential effects when learners return to school.

2.8. Estimated Cost of School Closures

Psacharopoulos, Patrinos, Collis and Vegas (2020) noted the power of COVID-19 to impel an unprecedented global shutdown, and identified university and mass school closures as two of the most shocking signs. The authors described education as pivotal to human capital investment and development; and argued continued school closures have development implications for learners, and business implications for instructors and owners of private academic institutions. Further, Psacharopoulos et al. (2020) argued learning would be lost during COVID-19. However, it is difficult to determine its effect on the duration of school closures; assess the impact on the global learning population, and the world's poorest and vulnerable populations. Other challenges include the possibility of recovered patients being re-infected; and longevity of steps towards development, licensing, and distribution of a viable vaccine across the globe. The authors observed the learning to be lost to COVID-19 would vary from one jurisdiction to the other, implying the losses would not be evenly distributed across countries. The consequences of children losing out on education are far-reaching; future opportunities including economic benefits in the form of compensation packages and additional earnings may be lost. Extant literature (as cited in Psacharopoulos et al.) found a significant relationship between learning loss during the extraordinary systemic crisis of World War II and the negative effect on lives of former students about forty (40) years later.

A survey led by the University College London (UCL) (as cited in The Guardian, 2020) sought to examine the evidence behind the government's decision to close down schools; and to assess the likely effect of the school closures on the fight against the spread of COVID-19 in the United Kingdom. The findings revealed COVID-19 had high transmission rate and low clinical impact on children. The researchers argued available statistics from influenza outbreaks showed the potential of school closures to influence and curb the spread of COVID-19 is low. Further, the researchers argued the decision to shut down schools following the outbreak of the Severe Acute Respiratory Syndrome pandemic in Singapore, China, and Hong Kong could not control the rate of spread and transmission. The researchers acknowledged findings from extant research which affirmed strong effect of school closures on the spread of pandemics when the implied virus has low transmissibility, but the rates of attack in children are high. They noted the reverse is true in the case of COVID-19. As a result, the government's decision to resort to school closures as one of the effective methods of containing and preventing further spread of COVID-19 in the United Kingdom is tenuous. The researchers echoed the need for the costs to be weighed against the benefits in making decisions related to school closures. Some of the costs associated with school closures include challenge to learners' health and damage to their education, the need for essential workers to take days off to care for their dependents, and drain on family finances. The category that is most at risk is vulnerable learners. Unfortunately, the research findings failed to elucidate the potential children-to-adults' transmission of COVID-19. That is, the tendency for children (learners) to transmit the virus to adults including instructors, caregivers, parents, and older siblings, among others, which accentuated and legitimised school closures by the UK government during the period.

Findings from the UCL-led survey suggested the social and economic costs of COVID-19-induced school closures to learners and their families outweighed the public health benefits while assumptions underlying the COVID-19 model were premised on unsubstantiated empirical evidence. The research outcomes affirmed the need for schools in the United Kingdom to practically commence preparations and to re-open after the initial wave of COVID-19 cases had passed through (Dingwall as cited in The Guardian, 2020). Although researchers in the University College London-led survey concluded school closures alone have limited impact on COVID-19 transmission, Prof. Neil Ferguson of Imperial College London (as cited in The Guardian, 2020) noted school closures could ensure significant decline in the transmission rate of

COVID-19 when combined with effective social distancing measures. The foregoing strategy severs remaining contacts among households. A spokesperson for the UK government noted the decision on school closures was taken based on scientific advice from experts on how to limit the spread of the pandemic. The decision to ask learners to stay at home was intended to save lives and protect the National Health Service (NHS); and schools would re-open when the scientific advice suggests it is safe to continue with face-to-face method of pedagogical and andragogical tuition across the country. Courtney (as cited in The Guardian, 2020) argued school re-opening should be predicated on adequate safety measures and sound empirical reasoning. To this end, the combination of measures instituted by the UK government should remain in place during the period.

Psacharopoulos et al. concluded mass school closures across countries today could have dire consequences tomorrow. Using annual mean earnings of US\$53,490, working life of 45 years, and discount rate of 3%, the authors revealed a student could lose about US\$1,337 annually on earnings with a present value of US\$33,464, representing 63% of annual earnings at current average wage rates. The authors noted the estimated loss of earnings per student from COVID-19 may appear insignificant. However, the amount is quite colossal when multiplied by the total number of students likely to be affected across the country. The estimated loss to the United States is US\$2.5 trillion, representing about 12.7% of GDP. The extrapolated global data estimated a loss of US\$10 trillion to the next generation. Psacharopoulos et al. noted the model adapted and figures churned out of their study were simple; they served as the starting point for further investigations into the effect of COVID-19 on education and future economic prospects of children and young people. Courtney (as cited in The Guardian, 2020) shared school re-opening should only be considered when it is scientifically proven that school closures could no longer suppress the COVID-19 pandemic. The following section presents discussion on the methodology adapted and used in the conduct of the current research.

3. Research Methodology

The quantitative approach to scientific inquiry formed the basis of the current research. Specifically, a cross-sectional design, an example of survey design, was adapted and used in the study. This design allowed the researchers to gather relevant research data over a specific period of time (Ashley, Takyi & Obeng, 2016; Creswell, 2009; Frankfort-Nachmias and Nachmias, 2008). Data required for the conduct of the current research were obtained mainly from secondary sources. These included text books, peer-reviewed articles published in journals, research papers, newspaper publications; Google Search Engine including worldometers.info, africanews.com, ghanahealthservice.org, who.int, and weforum.org; and electronic databases of international bodies such as the United Nations Education, Scientific and Cultural Organisation (UNESCO), among other significant sources. Respective data on pre-primary through secondary levels, and tertiary level for one hundred and eight (108) countries across the globe; population data for each of these 108 countries; and available data on COVID-19 were used in the study.

3.1. Analytical Tools

Descriptive statistics and regression models were used to describe the research variables; and to evaluate their behaviour over the stated time frame on global education. Measures such as standard deviation and range were employed to describe the extent of dispersion about the central tendency (Ashley et al., 2016; Creswell, 2009; Frankfort-Nachmias & Nachmias, 2008). These measures were used to describe trends in global education drawing on data for the 108 countries; and data for COVID-19 during the period.

3.2. Research Variables

The *independent* research variable was *total learners' population* while the *dependent* research variable was the relative effect of the total learners' population on *total national population*.

3.3. Regression Model

Regression statistical model was adapted to measure the effect and level of interaction of total learners' population on total national population over the research period. Specifically, the research sought to measure the extent to which respective global governments' decisions to re-open schools while effective medication has not been discovered could negatively impact spread of COVID-19 among their respective total national populations, especially when most school children were found to be asymptomatic; and transmission of the virus from asymptomatic patients to others was prevalent and severe. The research sought to measure the extent to which in a given academic year, pandemics such as COVID-19 could significantly impact on successful completion of planned educational programmes and activities in countries and territories across the globe, controlling for other internal and external environmental factors such as Tsunamis, hurricanes, earthquakes, and bushfires. The Microsoft Excel analytical software was adapted and used in the research. Diagrams and tables were derived from Microsoft Excel to explain the research data.

3.4. Research Hypotheses

The study tested causal relationship between total learners' population and total national population values using the following null and research or alternative hypotheses:

- $H_0: \mu_1 = \mu_2$; this implies total learners' population has no strong effect on total national population
- $H_1: \mu_1 \neq \mu_2$; this implies total learners' population has strong effect on total national population

4. Research Findings and Discussions

The underlying objective of the current research was to examine the extent of influence that pandemics such as COVID-19 could have on the successful implementation of intended annual academic programmes and activities in various countries and territories across the globe. To achieve the foregoing objective, the study sought to test the causal relationship between total learners' population and total national population. The latter helped to measure the extent to which academic institutions could contribute to the spread of the pandemic, controlling for other internal and external environmental factors. Findings from the current research and related discussions are presented in this section. The section presents findings based on review of existing and related literature on the phenomenon; and based on empirical analysis of sampled data. The discussions are categorised into sub-themes and presented as follows.

4.1. Education for Sustainable Development

The Global Action Programme (GAP) on Education for Sustainable Development was adapted by UNESCO for the period 2015 through 2019. This programme was known as the *GAP 2015-2019*. The overarching idea was to ensure significant improvement in global education while contributing meaningfully to the United Nations (UN) Sustainable Development Goals (SDGs). In November 2019, UNESCO organised its 40th General Conference on global education. The conference resulted in the adaptation of the new Global Framework on Education for Sustainable Development from 2020 through 2030. This initiative was dubbed *ESD for 2030*; and sought to contribute to the achievement of the seventeen (17) SDGs by strengthening Education for Sustainable Development through the development of sustainable and just global community. After the unfortunate wind of COVID-19 had blown away and the dusts had settled, UNESCO intended to host a global conference on education for sustainable development. The conference sought to highlight the challenges arising from COVID-19; and to emphasise the indispensable role of ESD in the successful implementation of policies and achievement of the 17 SDGs. Finally, the conference was expected to strengthen education for sustainable development in policy and practice.

UNESCO sought to develop a common framework that would ensure the integration of its Education for Sustainable Development and the 17 SDGs into 'policies, learning environments, capacity building of educators, empowerment and mobilisation of youth, and local level action' (Diop and Jain, 2020, para. 7). Through Education for Sustainable Development, UNESCO sought to internalise the unintended impact of an individual's actions and behaviour on others. The ESD led to the introduction of novel subjects such as environmental sustainability and gender studies. Systems of education throughout the world are putting the necessary measures in place to impart knowledge of the foregoing subjects to students at the early stages of their academic development.

The underlying objective of the Education for Sustainable Development agenda is to draw on multidimensional, multidisciplinary, and interdisciplinary approaches to translate academic concepts into real-life situations and challenges that are relatable; and to find solutions to the identified challenges. Some academic areas of focus under the ESD are communication, leadership, problem-solving, and critical thinking skills. The foregoing courses are often ignored in the curricula of many schools in many jurisdictions; and even when they are included, little attention is paid to them. However, findings from the current research suggested UNESCO's affirmation of the courses' importance through the Education for Sustainable Development; and the urgent need for their application led to improvements in the analytical prowess and critical thinking skills of students; and helped in addressing teething challenges facing the global community including peace building, gender bias, socio-economic inequality, and climate change, among others.

The decision to review and improve on existing curricula for schools through the ESD led to the development of virtues such as compassion and empathy. Further, it resulted in better grades for learners; and created tremendous opportunities for academic and professional development of students in various jurisdictions around the world. Although a lot remains to be done in this area, the success story thus far encouraged UNESCO to engage member countries, policy makers, and academic institutions to scale up their implementation efforts. It is believed rigorous pursuit of this initiative would help reduce the deficit identified in the implementation of the Education for Sustainable Development as a strong enabler for the achievement of all the 17 Sustainable Development Goals. Thus, the focus of ESD is not limited to education; it is extended to include broader socio-economic challenges. The latter could be achieved with relative ease if the former results in the development of efficient, effective, and productive human capital for the local and global economies.

Sustainable Development Goal four (4) of the United Nations stresses the need for inclusive quality education for all by 2030. Available statistics from UNESCO (as cited in Giannini and Albrechtsen 2020) revealed as of 31st March, 2020 over 1.54 billion learners at various levels of education across the globe (pre-primary through secondary levels; and tertiary level) were severely impacted by COVID-19. Included in this number were about 743 million girls. The number of school closures as a result of the pandemic affected over 89% of the total learners' population across the globe. The research findings revealed more than 111 million of the affected 743 million girls lived in least developed countries where access to basic and higher levels of education was fundamentally a struggle. Some of the least developed economies with the anecdote education challenges include South Sudan, Niger, and Mali. The challenges were borne out of national economic vulnerabilities, limited priority for education, extreme poverty, and gender disparity in education owing largely to religious and traditional beliefs. Globally, these countries have some of the lowest enrolment and completion rates for girl-child education; and COVID-19 exacerbated the crisis; more than four million girls were out of school following school closures.

Effect of the Ebola pandemic on adolescent girls in some communities in Sierra Leone was devastating; pregnancies among adolescents increased up to 65%. A major reason for the increase was lack of protection outside the school environment (Giannini and Albrechtsen, 2020). Findings from other studies (as cited in Giannini and Albrechtsen,

2020) revealed an increase in transactional sex as vulnerable girls and their respective families struggled to make 'two basic ends meet' during the Ebola outbreak. Some homes lost their 'breadwinners' from the Ebola pandemic; and this destroyed the basic source of livelihood. To mitigate the 'economic shortfalls,' many families decided to give the hands of their adolescent girls in marriage. This was expected to reduce the financial burden on families and to provide protection for the adolescent girls against sexual exploitation. Physical and sexual abuse among adolescent girls by older men and their peers surged in countries adversely impacted by the Ebola outbreaks. The abuse occurred when these girls were left at home and unsupervised by their parents or guardians.

4.2. Identified Gaps in Educational Service Delivery

The devastating nature of the Coronavirus pandemic revealed obvious gaps in countries and territories' mapped-out programmes and activities for education. Notable among these gaps was inequality in access to education. Many countries were found to be grappling with equal access by both privileged and under-privileged learners to technological learning platforms developed and implemented at the initial and peak stages of the COVID-19 pandemic. The pandemic exposed the existing gap between learners in urban and rural areas; between privileged and under-privileged learners; and unpreparedness of many countries to bridge those gaps at the outset of the COVID-19 pandemic. Most learners from economically less-endowed homes and communities had difficulties accessing electricity supply, computers, the Internet, and other technological devices required to facilitate their active participation in distance and online learning during the pandemic period. In France, about 5% of the total learning population was found to have no access to computers or Internet. Though many countries were unprepared, their responsiveness was encouraging. As noted earlier, many countries including China, France, the United States, Cyprus, Egypt, among others, rose to the occasion; they ensured learners in both deprived and urban communities had access to continuous education.

To assure equity and equal learning opportunities, schools in Washington State in the United States were encouraged to provide online learning services on condition that no learner would be left behind. The Portuguese government noted the challenges of inequitable access to online learning services among learners in the country: some learners had no access to computers and Internet. To address these challenges, working sheets were delivered to learners in their respective homes through the post office. The initiative was a partnership between the Portuguese government and the post office. The French government ensured the less-privileged learners (constituting about 5% of total learners) were provided with printed assignments and devices required for Internet connectivity and active participation in distance and online learning platforms during school closures occasioned by COVID-19.

The Chinese government subsidised telecommunication and mobile data package for all students; and provided computers for learners from economically less-endowed homes and families. In the wake of the COVID-19 pandemic, the United Arab Emirates government established a hotline for learners and instructors, so technical assistance could be provided when they encountered challenges in the use of distance and online learning platforms. This measure was meant primarily to minimise possible disruptions in the learning process. In the Republic of Korea, France, and Japan, among other countries, few schools remained open during the pandemic period, so learners who could not be cared for at home ostensibly due to the nature of their parents' or guardians' professions could be accommodated.

Thailand and Japan made special arrangements which allowed instructors (when the respective economies were not under lockdowns) to pay regular visits to learners, their families and caregivers. The visits allowed instructors to monitor the progress and well-being of learners; and to interact with parents and caregivers to advise same on how to facilitate and promote effective learning of their wards at home. Many learners perceived the physical learning environment as a safe haven for promotion and maintenance of social contacts. Thus, prolonged school closures were believed to undermine this social cohesiveness. In Thailand, Ghana, and many other countries, communications apps such as WhatsApp were employed to ensure constant interaction between instructors and learners during the lockdowns and school closures. This limited the extent of social isolation and increased the psychological feeling of social inclusion and belonging among learners. In addition to the foregoing, special arrangements by countries such as the United States, China, Spain, and Japan allowed for the creation of 24-hour hotline, monitored calls, and provided psychological assistance for those in need, so they could steer clear of any feeling of social isolation.

4.3. Economic Cost and Teenage Pregnancies

In most African and global economies including Ghana, private educational institutions at various levels derive their revenues from tuition fees. This enables them to meet recurring expenses including payment of staff salaries. Further, tuition fees enable them to mobilise funds for expansionary projects; and to pay off outstanding loans, among other significant financial obligations. Thus, prolonged school closures tended to affect the financial strength of private educational institutions, and the ability to honour their financial obligations to key stakeholders including instructors and other staff. The estimated financial loss from the recent school closures occasioned by COVID-19 to private institutions in Ghana was monumental. As a result, proprietors of most private institutions in Ghana had to resort to the government for a financial bailout to meet the financial needs of their respective instructors. These private institutions were expected to benefit from funds released by the government of Ghana (GH¢600 million) through the National Board for Small Scale Industries (NBSSI) to assist small and medium-size enterprises (SMEs). A news bulletin on BBC on Tuesday, 2nd June, 2020 disclosed the colossal amount lost from revenue to tertiary institutions in the United Kingdom (US\$18 billion) and United States (US\$45 billion). The estimated revenue lost to tertiary institutions in the United States was about 2.5 times the revenue lost to tertiary institutions in the United Kingdom during the period. Further statistics shared by the BBC revealed about 5% of all tertiary level learners in the United States were enrolled online while online students constituted about 20% of all tertiary level learners in the United Kingdom. The BBC report was consistent with Psacharopoulos et al. who

found mass school closures could have development implications for learners, and business implications for instructors and owners of private academic institutions.

One of the greatest challenges envisioned by some educationists during the prolonged school closures was parents' and other stakeholders' inability to provide the needed protection for female adolescent learners against early pregnancies. In Ghana, about six Junior High School female learners and five female learners at the Senior High School levels were reported pregnant during the writing of their respective terminal examinations organised by the West African Examinations Council in 2020. Statistics released by the Ghana Education Service (GES) (as cited in Opera News, 2020) showed a total of six hundred and seventy-six (676) pregnancy cases were recorded among learners between March 2020 and September 2020 in the Volta Region, one of the sixteen (16) regions in Ghana. The pregnancies were recorded among learners at the primary (176), JHS (325) and SHS (175) levels while two hundred and eighty-five (285) nursing mothers were identified to have resumed classes in their respective schools during the period. Most of these nursing mothers were at the Junior High School and Senior High School levels. The foregoing reports confirmed earlier studies by UNESCO (2020a&c) and Giannini and Albrectsen (2020) which found prolonged school closures were a conduit for early and teenage pregnancies among learners at their adolescent stage.

4.4. Re-opening of Schools

The decision to re-open schools was found to be topical in some jurisdictions across the globe. Madam Stefania Giannini, the UNESCO Assistant Director-General for Education (as cited in UNESCO, 2020b), believed decisions related to schools' re-openings formed part of the most sensitive issues on today's political agenda; and that, re-opening decisions were integrally predicated on specific contexts in each country and territory, and the extent to which the Coronavirus pandemic evolved. Madam Giannini (as cited in UNESCO, 2020b) affirmed the need for countries itching to re-open their respective schools to develop and build the trust of learners; and put the necessary remedial measures in place to protect the health of learners, and their well-being. During the year (2020), the World Bank, World Food Programme (WFP), United Nations International Children's Fund (UNICEF) and UNESCO presented a framework for schools that were preparing to re-open. The framework was intended to provide a roadmap for authorities at the national and local levels in decision-making. Further, the framework was expected to facilitate the authorities' decisions on how, why, and when schools should be re-opened.

On 29th April, 2020, UNESCO convened a virtual ad-hoc meeting of education ministers around the world. The meeting afforded global education ministers the opportunity to share their school closure experiences and re-opening strategies and measures. As of 30th April, 2020 over seventy-one (71) countries had announced re-opening dates for schools. This number included fifty-two (52) countries with already determined re-opening dates during the current academic year; twelve countries that had already re-opened their respective schools; and seven (7) countries that had postponed their respective re-opening dates to the next academic year. Although some countries were considering re-opening their respective schools, there was a common consensus on the planning process: school re-opening would be carried out in phases with priority given to remedial learning, health, and safety of learners, instructors, and administrative staff. The research revealed more than one hundred and twenty-eight (128) countries were yet to announce their respective re-opening dates as at 30th April, 2020. In percentage terms, the number of countries with unconfirmed schools re-opening dates was approximately 64.32% $((128 \text{ countries} \div 199 \text{ countries}) \times 100\% = 0.643216 \times 100\% = 64.3216 = 64.32\%)$. This was significantly higher than the number of countries with confirmed dates (35.68%). Specifically, the total number of countries that had already re-opened and the number that was set to re-open in the current academic year were 64 $(52 + 12 = 64)$. This represented about 32.16% $((64 \text{ countries} \div 199 \text{ countries}) \times 100\% = 0.321608 \times 100\% = 32.1608 = 32.16\%)$ of the total number of countries (199) sampled; and about half the total number of countries (64.32%) with confirmed dates.

At the UNESCO meeting held on the afore-mentioned date, there was a consensus among education ministers for progressive re-opening of schools; and maintenance of distance and online learning until all learners returned to school. Participants were unanimous on the need for re-opening decisions to be informed and guided by the evolution of the Coronavirus pandemic. This was to avoid the possibility of second wave of the pandemic in any country or territory across the globe. Extant research (Centres for Disease Control and Prevention, 2010; Hine, 2010; Samanlioglu and Bilge, 2016; Saunders-Hastings and Krewski, 2016) revealed the second wave of pandemic eruption in most countries that eschewed due diligence in making decisions related to school re-openings in recent years. Participants at the UNESCO meeting believed the various individual and collective innovations announced and implemented by countries during the school closures would be influential in andragogical and pedagogical practices when schools re-opened globally.

In addition to online platforms, learning contents were delivered through television and other media in many countries including Rwanda, Senegal, Argentina, Costa Rica, Peru, Mexico, Saudi Arabia, Islamic Republic of Iran, China, Republic of Korea, Vietnam, Thailand, France, Croatia, and Ghana, among others. In Thailand, Costa Rica, and the Islamic Republic of Iran, the levels of communication between instructors and learners were maintained and enhanced through the use of existing apps. To ensure the success of distance learning programmes in the United Arab Emirates during the COVID-19 pandemic, government agencies launched communication strategies on distance education for all key stakeholders. These included school administrators, instructors, learners, and parents. Saudi Arabia relied on her official Twitter account for regular dissemination of valuable information on online learning to targeted groups (Chang & Yano, 2020). The following section presents strategies adapted by countries in various regions across the globe to re-open their respective academic institutions while mitigating risks and unwanted spill-overs.

4.4.1. Re-opening Strategies in Africa

Some analysts noted the globe and especially, Africa's inability to remain in the present predicament occasioned by COVID-19 forever. It was therefore imperative to identify and institute measures that would assure learners' return to their respective classrooms within a reasonable period. However, key stakeholders such as the parent-teacher associations, school management committees, teachers' and some students' unions raised concerns about timely re-opening of schools since challenges associated with strict adherence to physical and social distancing rules could put the lives of learners, instructors, and other academic staff at risk (All Africa, n.d.). The research revealed remedial measures put in place by countries and territories throughout the world during the COVID-19 period were intended to duck, to the extent possible, any disruption in academic learning. As of 24th March, 2020, continuous learning through distance and online or Internet platforms was functional in the United States, Mexico, Argentina, Egypt, Cyprus, France, Italy, Greece, Portugal, Croatia, China, Republic of Korea, United Arab Emirates (UAE), Japan, and Saudi Arabia. The mode of adaption and implementation in the respective countries was contingent on the extent of technological development (Chang & Yano, 2020). Later, these platforms were adapted for implementation in countries such as Ghana. In the latter, a special television channel (Ghana Learning) was introduced by the State broadcaster, Ghana Broadcasting Corporation, to provide learning platforms for learners at the Junior High School (JHS) and Senior High School (SHS) levels. Tertiary institutions activated their online portals while those deficient in online teaching and learning platforms were compelled to establish same within short periods. In Ghana, the decision to re-open schools was premised on Ghana Education Service's ability to provide scientific and published data which were convincing. These empirical proofs required the consensus and support of key stakeholders, including parents. Indeed, strict adherence to the necessary protocols could prevent further spread of COVID-19 on the continent (All Africa, n.d.).

On 31st May, 2020, Ghana's current President, Nana Addo Dankwa Akuffo-Addo, announced measures to ease some of the restrictions imposed on the economy following the outbreak of the COVID-19 pandemic. These included re-opening of schools for final year learners in tertiary institutions; and final year students at the JHS and SHS levels preparing for this year's terminal examinations organised by the West Africa Examination Council (WAEC). Later announcements affirmed re-opening of schools for other levels of JHS and SHS learners. However, school re-openings for learners at the primary level were postponed to January 2021. The restrictions were lifted amidst stringent calls for the observation and implementation of physical and social distancing rules to assure containment; and to prevent further spread of the COVID-19 pandemic.

Ghana's approach to school re-openings seemed to have been successful; there were no major adverse findings relative to spread of the virus in many parts of the country although few escalated cases were recorded in some senior high schools at the outset of the re-openings. Available data from Worldometer (2020b) revealed as of 18th October, 2020, Ghana had recorded the following statistics on COVID-19: total number of reported cases (47,232), deaths (310), recoveries (46,578), active cases (344), and critical cases (9). The data showed about 98.6% recovery rate in Ghana during the period (Ghana Health Service, 2020). The COVID-19 pandemic had spread to 215 countries and territories across the globe; and to 2 international conveyances during the period. In Ghana, some tertiary institutions organised virtual graduation ceremonies for learners who had successfully completed their respective academic programmes and had met graduation requirements of their respective academic faculties.

On 15th March, 2020, all tertiary institutions in Kenya were ordered to close down to prevent further spread of the COVID-19 outbreak in the country. This was in tandem with similar decisions in many other African countries; and decisions taken in countries and territories in other regions across the globe. However, in early July 2020, Kenya announced her decision to phase-out re-opening of schools across the country. The re-openings were to commence with tertiary institutions in September 2020 under strict guidelines. It was incumbent on university authorities to consider staggering of their respective academic studies. The latter was intended to assure compliance with physical and social distancing rules in key areas such as lecture halls, dining halls, and halls of residence to complement the Health Ministry's efforts at ensuring the health and safety of learners while minimising and preventing further spread of the virus in the country. Considerations for re-opening of tertiary institutions for face-to-face interactive sessions were to be on a case-by-case basis, and subject to compliance with the necessary COVID-19 protocols recommended by the Health Ministry (Nganga, 2020).

However, prior to September 2020, tertiary institutions in Kenya were expected to continue with their respective online teaching and learning programmes while the portentous COVID-19 was observed in terms of risk for further spread. A statement issued by Professor George Magoha, Kenya's Cabinet Secretary for Education (as cited in Nganga, 2020), noted tertiary institutions that failed to comply with the COVID-19 protocols after re-opening risked closure. Professor Magoha further stated the implementation of prior decisions on re-opening of educational institutions arrived at with key stakeholders would be contingent on COVID-19 updates provided by the Health Ministry, including increased knowledge and prevailing circumstances of the pandemic.

Available projections indicated the total number of reported COVID-19 cases in Kenya were expected to peak in August and September 2020. As of 18th October, 2020 the respective total numbers of reported and recovered cases in Kenya were 44,196 and 31,752. The total number of reported cases (44,196) was a significant (about 435.71%) increase over the 8,250 confirmed cases recorded as at 7th July, 2020. Authorities in Kenya announced the postponement of re-opening date for basic institutions from September 2020 to January 2021. This was consistent with the academic decision arrived at and announced by Ghana's President, Nana Akuffo-Addo, on re-opening of primary schools across the country.

As of 25th June, 2020 no date had been set for re-opening of schools, including tertiary institutions in Nigeria. Earlier, on 13th June, 2020 a virtual meeting was held between the Federal Minister of Education, Professor Chukwuemeka Nwajiuba and heads of tertiary institutions in Nigeria. The virtual meeting afforded Professor Nwajiuba the

opportunity to outline the needed measures to be taken by tertiary institutions prior to their re-opening. The COVID-19 protocols outlined by Professor Nwajiuba included the need for the availability of body disinfectants, body temperature checks, and hand washing detergents and equipment at various points of entry into major facilities of each tertiary institution. These facilities included offices, lecture halls, hostels, and main gates. The measures included decontamination of the entire premises of each tertiary institution; stringent efforts to maintain hygiene at all times while observing physical and social distancing rules in lecture halls and at other meeting venues. Meanwhile, all tertiary institutions were to remain closed until further notice. Early announcement on the closures of all tertiary institutions in the country was made on 23rd March, 2020. A section of Nigerians supported the Federal government's decision to postpone re-opening of schools citing potential further outbreak of the COVID-19 pandemic. Rather, proponents called for the institutionalisation of optimal health and safety conditions in various academic institutions before re-opening was considered. This initiative was necessary to mitigate rising numbers of reported COVID-19 cases in the country (Fatunde, 2020).

Nationwide school closures in Zambia were announced on 20th March, 2020. In June this year, the Zambian government served a month's notice to tertiary institutions in the country to plan and prepare for re-opening, which was to be carried out in phases. The Zambian Education Minister, Dr. Brian Mushimba, noted COVID-19 may linger on for an extended period. Therefore, it behoved the people of Zambia to be psychologically conditioned to embrace the new normal trend occasioned by COVID-19 in many countries and territories across the globe. The Zambian government's decision to re-open tertiary institutions in phases, starting from 1st July, 2020 was received with mixed reactions. Many were those who doubted the successful outcome of the initiative; they believed the decision to re-open was too early; and that, the containment measures in tertiary institutions and at the national level may be defeated by the 'sudden' re-opening of tertiary institutions during the period. The foregoing assertion was corroborated by Dr. Kelvin Mambwe, General Secretary of the Lecturers and Researchers' Union at the University of Zambia when he bemoaned the poor state of facilities, including inadequate water supply, poor sanitation, and accommodation challenges. The relatively large class sizes and congestions at the halls of residence raised concern about the successful implementation of the social distancing rules. Similar announcement by the Zambian President, Mr. Edgar Lungu, affirmed re-opening of physical classes on 1st June, 2020. He stressed the need for re-openings to be prioritised with final year learners preparing for their examinations resuming classes first (Tonga, 2020).

To ensure efficient, effective and uninterrupted academic service delivery during the COVID-19 period, the Zambian government, through the Higher Education Ministry, recognised online learning activities as an integral part of the learning process for graduating learners and others at the tertiary level. However, its successful implementation was hampered by erratic power supply and weak Internet service in the country. Graduating ceremonies for learners at the tertiary level were expected to be organised virtually while those who paid tuition for on-site learning, but were denied due to the COVID-19 outbreak would enjoy refund. Authorities in tertiary institutions announced their preparedness to ease lockdown restrictions in compliance with guidelines provided by the Higher Education Ministry (Tonga, 2020).

South Africa remained the epicentre of the COVID-19 outbreak in Africa prior and during the research period. The surge in total number of reported cases coupled with high case fatality rate raised concerns within and without about the country's ability to be successful in her containment efforts. This was especially so, when re-opening of schools was considered and implemented amidst increasing number of reported cases and deaths. The country considered re-opening schools in phases; learners in Grades R, 6 and 11 were scheduled to re-open on 6th July, 2020. During the period, provinces that were not ready to accommodate Grade R learners were tasked to present strategic and realisable plans which would ensure their re-incorporation into the school system at a later date. Schools that could not make the necessary arrangements to accommodate Grade R learners were given up to the end of July 2020 to ensure their re-incorporation. Prior to the re-opening of schools for learners in the foregoing Grades, learners in Grades 7 and 12 were scheduled and re-opened on 8th June, 2020. Thus, the latter were scheduled to re-open before the former. However, after the re-opening on 8th June, 2020 about 2,740 instructors, and 1,260 learners in 7th and 12th Grades were reported infected by COVID-19. Statistically, the number of instructors infected (2,740) represented about 0.62% of the estimated total instructors' population of 440,000 at the basic education level. The report noted the number of infected learners (1,260) constituted about 0.01% of all learners in the 7th and 12th Grades (Xinhua, 2020).

The preceding formed part of the country's phase one re-opening arrangements. In all, 25,762 schools were re-opened. However, the increase in transmission among instructors and learners impelled the re-closure of 968 schools during the period. The escalation in outbreaks resulted in some fatalities: three learners, eleven instructors, and four non-teaching staff were confirmed dead through COVID-19 during the period. South Africa's experience confirmed extant research which affirmed countries' decision to re-open schools at set dates without due recourse to both pharmaceutical and non-pharmaceutical interventions could escalate, rather than contain and minimise spread of the virus. To stem the growing tide of COVID-19, South Africa's Basic Education Minister, Madam Angie Motshekga, stressed the need for strict adherence to the COVID-19 protocols; she emphasised the need for adherence to the COVID-19 protocols to be the responsibility of all and sundry; social distancing, health and safety protocols were to be duly observed in all academic institutions to enhance containment; and to prevent further spread of the virus (Xinhua, 2020). The study revealed although the respective ratios of infection for instructors (0.62%) and learners (0.01%) were considered low, the real impact on human lives was significant as evidenced in the total number of reported deaths (17 deaths) during the period.

All the twenty-seven public tertiary institutions (universities) in South Africa were affected by the outbreak. The COVID-19 pandemic affirmed the need for the various institutions of higher learning across the country to improve on their respective technological infrastructure to ensure effective online tuition. A blend of onsite and online learning was identified as the 'best way' to assure uninterrupted and successful academic year (Czerniewicz, 2020). South Africa's COVID-19 challenges could be described as enormous. As of 21st October, 2020 the total number of reported COVID-19

cases stood at 706,304 with 639,568 recoveries. The total number of deaths was estimated at 18,656. The foregoing data implied South Africa ranked first in Africa and twelfth among 215 countries and territories and 2 international conveyances during the period. The foregoing statistics showed significant increases over the respective reported cases (205,721), deaths (3,310), and recoveries (97,848) recorded early on 7th July, 2020. Respectively, South Africa ranked fifteenth and first globally and in Africa during the period (Worldometer, 2020b).

4.4.2.Re-opening Strategies in Asia

Many countries in Asia were concerned about likely actualisation of the relationship between immediate school re-openings and possibility of second wave of COVID-19 in the region. To avoid setbacks, Mr. Hossein Salar Amoli, Iran's Acting Minister for International Scientific Co-operation suggested the need for school closures to be extended; and to be re-opened during the new academic year in September 2020. He noted the re-openings should be contingent on the evolution of the COVID-19 pandemic. However, gradual re-opening could commence with learners at the tertiary level while each country's progress in recovery from the pandemic was monitored. The foregoing notwithstanding, Mr. Amoli affirmed the need for distance and online learning methods to be adapted and implemented for the rest of the current academic year. As of 24th March, 2020, nationwide school closures were in effect while school fees were being refunded to families in Japan. However, few months later, the Japanese government, through the Assistant Minister of Education, Mami Omayama, announced gradual re-opening of schools and determination of dates for various examinations in the country. Decisions related to the foregoing were contingent on the evolution of the COVID-19 pandemic. Planned re-openings were expected to be guided by thorough recommendations on safety and health measures and protocols (UNESCO, 2020b; Chang & Yano, 2020).

The Minister of Education for Lebanon, Mr. Tarek Al Maizoub, noted the socio-economic crisis necessitated by the COVID-19 pandemic in the country was unprecedented. As a result, re-opening of schools in the country was to be carried out in phases while tapping new ideas to assure success. Mr. Al Maizoub believed the outbreak of COVID-19 was a defining moment for various countries and territories to embrace and facilitate the promotion of global educational solidarity that is resilient and robust in character (UNESCO, 2020b; Chang & Yano, 2020). However, on Tuesday, 4th August, 2020 the people of Lebanon were saddled with unpleasant socio-economic news. The news entailed two massive explosions of 2,750 tonnes of ammonium nitrate at the port of the city of Beirut, Lebanon's capital. The explosions which were detected by the United States Geological Survey were felt in some parts of Europe, Northern Israel, Turkey, and Syria. The explosions were measured as a seismic event with 3.3 and 4.5 local magnitudes by the United States Geological Survey and the Jordan Seismological Observatory respectively. There were widespread agitations about the repercussions of the explosions on the Lebanese economy; it was believed the explosions could significantly affect the prospects for economic recovery. The explosions re-ignited protests which began in October 2019 calling for the resignation of the government, citing incompetence, negligence, and corruption as the principal factors for the outrage (BBC, 2020b&c).

The massive shock wave, which ensued the explosions shook the ground across Beirut, overturned cars, and damaged buildings. In swathe of Beirut, many people were compelled to live in severely damaged homes, mostly without doors or windows or both. A representative of the International Red Cross Committee described needs of the victims as colossal. The extent of damage caused by the explosions to the two main electricity and water stations in Beirut was very monumental. Affected victims were in dire need of food, shelter, cleaning detergents; and assistance to clean major debris and leftovers in their homes. Efforts to rescue victims in the Beirut explosions were strained by the intensity of the COVID-19 pandemic which had already stretched existing medical facilities in the capital, and in some parts of the country. Major treatment centres were severely affected by the explosions (Nature, 2020).

The recent explosions in Beirut resulted in two hundred and twenty (220) deaths and over six thousand (6,000) injuries. More than one hundred and ten (110) people were reported missing while over three hundred thousand (300,000) people were rendered homeless (BBC, 2020b&c). The explosions complicated already-existing power and water crisis in Lebanon. As a result, the country was rationing power daily. This compelled many people to purchase generator sets to complement supply from the national grid. Prior to the explosions, the country was embroiled in a major economic downturn; the economic situation was exacerbated by the explosions, pushing more families into the hunger and poverty brackets. The challenges compelled the United Nations agencies to warn of humanitarian crisis in the country unless aid, in the forms of food and medicine, was delivered swiftly to victims in affected areas (Nature, 2020).

In response to the tragic explosions, 5th August, 2020 was declared a National Day of Mourning while the Lebanese government declared a state-of-emergency for two consecutive weeks. President Aoun noted the government's preparedness to provide the requisite support for displaced persons; the Ministry of Health's readiness to bear the cost of treatment for all injured persons; and the government's commitment of 100 billion Lebanese pounds (equivalent to US\$66 million) in aid to support recovery operations. The Lebanese Red Cross Society (LRCS) noted the dispatch of every available ambulance from the southern and northern parts of the country to Beirut to rescue patients. The LRCS was able to activate 375 medics and 75 ambulances in response to the explosions. In the absence of a state-sponsored clean-up exercise, local business moguls offered to repair damaged buildings at no cost to beneficiaries; and debris in affected buildings were removed by volunteers. On 5th August, 2020, Hezbollah launched a blood donation campaign in the country. Individuals willing to donate blood were offered free ride to and from blood donation centres and hospitals by *Careem*, a ride-sharing app in Lebanon.

Financial supports offered by Denmark (€20 million), Norway (€6.5 million), United States (\$15 million), Germany (€11.5 million), European Union (€63 million), and the United Kingdom (£25 million) was expected to help Lebanon address most of her current socio-economic challenges emanating from the explosions. The support was envisaged to help the country address some of the teething difficulties introduced by the COVID-19 pandemic. The

immediate supports from France and Spain were not financial; France provided medical and food aid, and pledged to provide materials needed for reconstruction while Spain provided medical supplies, shelters and wheat. The blasts left Lebanon with two critical needs: rebuilding of infrastructure such as schools, hospitals, electricity and water treatment plants; and emergency humanitarian aid, including shelter, water, food and medicine. There was a common consensus among global leaders at the virtual summit organised to solicit funds for the country. That is, the need for the Lebanese government to improve on the perceived levels of corruption; accelerate economic reforms and accountability; and the need for the assistance to be channelled directly to the Lebanese population in the most transparent and efficient manner (BBC, 2020b&c). The explosions which were described by some analysts as tragic, and one of the major accidents in the annals of global industrial history complicated challenges related to successful organisation of educational programmes in the country at the peak of the COVID-19 outbreak.

Madam Sengdeuane Lachanthaboune, the Minister of Education for the Lao People's Democratic Republic indicated gradual re-opening of schools in the country was expected to commence on 18th May, 2020. The re-opening was expected to commence with learners in various grades preparing for pending examinations before extending the re-opening to all academic institutions few weeks later. However, the country expected to maintain arrangements for distance and online learning through technological platforms, radio and television while preventive measures such as physical and social distancing, wearing of masks, and body temperature measurements were to be strictly enforced and implemented respectively (UNESCO, 2020b; Chang & Yano, 2020).

4.4.3. Re-opening Strategies in Europe

Madam Lucia Azzolina, Italy's Minister of Education, minced no words when she affirmed the indispensable role of education in the nation's recovery process from COVID-19; and the role of education in the development of quality human capital to provide the requisite technical advice, guidance and direction to assure rapid national economic transformation in post COVID-19 period. Given the precarious nature of the pandemic crisis in the country, the Italian government extended school re-opening date to September 2020. The decision was borne out of recommendations of scientific committee, monitoring of distance and online learning activities, and broader consultation with other key stakeholders in education. Madam Azzolina noted the Italian government's decision on school re-opening was based on evidence.

The Italian government through its Ministry of Education encouraged young graduates to join the teaching profession. The education ministry planned to organise massive remedial classes at the beginning of next academic year to help learners offset any academic loss that might have arisen from the long academic break. To this end, the education ministry was expected to hire 2,400 additional teachers to augment the population of instructors in the country. The Coronavirus pandemic truncated the academic calendar in France and many other countries and territories across the globe. In Vietnam, Spain, and Republic of Korea, similar arrangements were considered; the respective academic calendars were adjusted to make up for the number of learning days lost to the Coronavirus pandemic (UNESCO, 2020b; Chang & Yano, 2020).

Akin to the Italian government's strategy, the French government, through its Education Minister, Mr. Jean-Michel Blanquer announced a gradual approach to re-opening of schools across the country, starting from 11th May, 2020. The non-uniformity of re-opening of schools in France was attributed to variations in the number of reported cases and deaths across regions. Thus, re-opening was expected to commence gradually in areas least affected by the COVID-19 pandemic. However, the French government introduced flexibility and options; parents were at liberty to either send their children or wards back to school or allow them to stay at home to continue with distance and online learning programmes introduced earlier to minimise the sporadic effect of COVID-19 on the country's academic calendar and programmes. Precautionary measures adapted for implementation included health and safety guidelines for all schools; and limit to the number of learners in each classroom. As part of the measures, Mr. Blanquer noted learners would be divided into different seating arrangements while the curricula to be adapted and implemented at various levels would consider the limited number of weeks left to end the current academic year. In Croatia, re-opening of schools was expected to be rolled out gradually. Gradual re-opening was envisaged to commence on 11th May, 2020 with parents being key stakeholders; the Croatian government allowed parents to finally determine whether or not their wards should return to school (UNESCO, 2020b; Chang & Yano, 2020).

4.4.4. Re-opening Strategies in South America

Many countries in South America including Costa Rica, Peru, and Argentina were indifferent to postponement of re-opening dates for schools. However, they were concerned about the growing levels of academic inequality engendered by the protracted COVID-19 pandemic. In Costa Rica, strict physical and social orders were still under implementation while standardised tests organised at the national level had been cancelled during the research period. Madam Melania Brenes, Costa Rica's Vice Minister of Education, noted the country was monitoring key areas to mitigate potential school dropouts in the country. The country was yet to announce tentative dates for re-opening of schools. As of 1st June, 2020 Costa Rica ranked 114th among 213 countries and territories with reported cases of COVID-19. The respective numbers of reported cases and deaths in Costa Rica during the period were 1,056 and 669. This translated into a national case fatality rate of about 63.35% $((669 \text{ deaths} \div 1,056 \text{ reported cases}) \times 100\% = 0.6335227 \times 100\% = 63.35227 = 63.35\%)$, which was about 10.61 times $(63.35\% \div 5.97\% = 10.611390 = 10.61 \text{ times})$ the global average (5.97%) during the period. The figures suggested Costa Rica's responsiveness and containment measures were not strong enough to mitigate the carnage inflicted on Costa Ricans by the predatory Coronavirus pandemic. The results implied about 64 of 100 reported cases in Costa Rica resulted in deaths; one of the staggering ratios recorded during the COVID-19 pandemic period. Available data on the total number of reported cases and deaths in Costa Rica did not support re-opening of

schools in the immediate term. Thus, the government's decision to postpone re-opening indefinitely, and to be more concerned about growing levels of academic inequality in deprived and rural areas during the research period were in order.

The challenges and 'aftermath' of COVID-19 compelled the Ecuadoran government to draw an important conclusion on education in the country. That is, to ensure significant paradigm shift from the 'customary' teaching and learning practices to the urgent need to strengthen distance and online learning as a permanent means of providing quality education to learners in Ecuador. Consequently, COVID-19 impelled the Ecuadoran government and policy makers in education to appreciate and integrate online learning into their national academic programmes. This initiative was expected to help minimise the extent of disruption; and adverse effects of future epidemics and pandemics on the country's academic calendar and programmes. Gradual re-opening of schools in the country was envisaged to be guided by interactions among instructors, learners, and parents; and provision of support when needed.

Available statistics on COVID-19 from World meter (2020b) revealed Ecuador had one of the highest numbers of reported cases in South America and across the globe during the research period. As of 1st June, 2020, Ecuador ranked 24th globally and 4th in South America with respective total reported cases and deaths of 39,098 and 3,358. This implied a case fatality ratio of 8.59% $((3,358 \text{ deaths} \div 39,098 \text{ reported cases}) \times 100\% = 0.085887 \times 100\% = 8.5887 = 8.59\%)$, which was about 1.44 times the global average. However, the total number of recovered cases (19,592) was more than the total active cases (16,148). One could infer the interventions in Ecuador were working effectively as the government strived to assure containment; and to minimise further spread of the Coronavirus pandemic in the country.

In Peru, the respective total numbers of reported cases and deaths during the period were 164,476 and 67,208, implying a case fatality ratio of about 40.86% $((67,208 \text{ deaths} \div 164,476 \text{ reported cases}) \times 100\% = 0.4086189 \times 100\% = 40.86189 = 40.86\%)$. The results suggested about 41 of 100 reported cases in Peru resulted in deaths; one of the overwhelming ratios recorded in the region and across the globe at the outset and during the peak of the pandemic outbreak. In terms of the total number of reported cases, Peru ranked 10th globally and 2nd in South America during the period. Between 24th May, 2020 and 1st June, 2020, Peru reported additional 48,722 cases (164,476 reported cases - 115,754 reported cases = 48,722 additional cases); and transitioned from the 12th to 10th position in the global rankings. The relatively high case fatality rate (40.86%) supported the Peruvian government's decision not to announce dates for re-opening of schools during the research period.

Mr. Martin Benavides, the Peruvian Minister of Education was equally concerned about the increasing levels of academic disparity between urban learners and learners domiciled in the rural parts of the country during school closures. Lack of computers and Internet facilities served as a major setback to equal access to distance and online learning in most rural communities. Mr. Benavides expressed Peru's readiness to tap from the experiences of other countries to plan its re-opening process (UNESCO, 2020b; Chang & Yano, 2020).

The total number of confirmed cases of COVID-19 in South America kept surging during the period. For instance, Argentina reported additional 5,498 cases (16,851 reported cases - 11,353 reported cases = 5,498 additional cases); and the total number of deaths increased from 445 to 539 between 24th May, 2020 and 1st June, 2020. As of 30th April, 2020, Argentina had not set dates for re-opening of schools. While monitoring the evolution of the COVID-19 pandemic, the Argentine government focused attention on the adaption and implementation of practical measures to ensure uninterrupted learning. These measures included learning through radio, television, provision and use of textbooks, and digital resources.

As of 24th May, 2020, cases of COVID-19 had been reported in two hundred and thirteen (213) countries and territories across the globe. Colombia ranked 36th globally with respective total number of reported cases (20,177) and deaths (705) (Worldometer, 2020b). The country's case fatality rate during the period was equivalent to 3.49% $((705 \text{ deaths} \div 20,177 \text{ reported cases}) \times 100\% = 0.03494077 \times 100\% = 3.494077 = 3.49\%)$. However, this was more than the case fatality rate (3.20%) recorded on 1st June, 2020 though the respective numbers of reported cases (29,383) and deaths (939) increased during the period. The increase in the number of deaths (234) was proportionately less than the increase in the number of reported cases (9,206); the latter was significant, it represented about 45.63% increase in total reported cases during the period. This explained why the case fatality rate (3.20%) as of 1st June, 2020 was less than the rate (3.49%) reported earlier on 24th May, 2020. The country ranked 31st globally as of 1st June, 2020; had recorded 19,901 active cases, and 8,543 recovered. Perhaps, the wave and trend of the Coronavirus pandemic in Colombia accounted for the government's decision to resort to gradual re-opening of schools. However, the data did not depict improvement in the containment measures by the Colombian government during the period.

To achieve set objectives and minimise adverse effects, Madam Maria Victoria Angulo, the Colombian Minister of Education announced her country's preparedness to focus attention on the rural communities to ensure non-pharmaceutical interventions such as social and physical distancing were effectively implemented. Colombia intended to implement different evaluation model for learners while digital applications were developed for instructors to help address issues related to academic and socio-emotional challenges of learners. The sporadic increase in the number of reported cases in the South American region affirmed earlier warnings by the World Health Organisation about Africa, Eastern Europe, Central and South America being the novel 'hot spots' for the Coronavirus pandemic; and the likelihood of these hot spots recording significant increase in number of reported cases, if the levels of preparedness and responsiveness in their respective countries and territories were not strong enough to stem the negative tide of COVID-19.

One of the major concerns of key stakeholders was the ravaging effect of COVID-19 on the world's ability to assure education characterised by quality, equity and inclusion. During the research period, the Office of the International Educational Planning Institute situated in the Argentine capital, Buenos Aires, was responsible for co-ordination and achievement of the Sustainable Development Goals in the Latin American Region by 2030. On 29th April, 2020 the institute

organised an online seminar to discuss the relationship among school, healthcare and family. The seminar involved seven hundred and twenty-five (725) participants drawn from Europe (France and Portugal), Africa, and South America in addition to two hundred (200) real-time participants. Discussions were focused on how effective planning could mitigate the adverse impact of COVID-19 on equity and inclusion in education; and the effect on realisation of the SDGs. The seminar sought to affirm the significance of timely educational planning and to identify strategic ways through which UNESCO and other key stakeholders in various jurisdictions could plan to make education accessible to all in both 'ordinary' and 'crisis' contexts while improving on existing academic structures to conform to international standards. Development of technical capabilities and consistent training emerged as essential 'tools' to sustain education and ensure quality and inclusion in crisis context such as COVID-19; and to propel education in the 21st century and beyond.

4.4.5. Re-opening Strategies in North America

Measures adapted by the Mexican government for implementation to mitigate adverse effects of COVID-19 on the nation's academic calendar included the televised broadcasts of education programmes to the nook and cranny of the country; radio broadcasts of education programmes in fifteen (15) different languages in areas not accessible to television; and provision of free textbooks to all learners. Priority of the Mexican government during school closures was maintaining a strong bond among instructors, learners, and parents. This was consistent with the strategy adapted by the Ecuadoran government aimed at strengthening the relationship among parents, learners, and instructors during and after school closures. The Mexican government did not announce her intention to re-open schools during the research period. This decision might have been borne out of the rapid rate of reported cases and deaths in the United States (1,837,170 reported cases; and 106,195 reported deaths as at 1st June, 2020); and spread of COVID-19 in Mexico in recent periods. For instance, in about a week (between 24th May, 2020 and 1st June, 2020), the total number of confirmed cases in Mexico increased from 65,856 to 90,664, representing about 37.67% increase during the period. The case fatality rate in Mexico as of 1st June, 2020 was equivalent to 10.95%; this was slightly more than the rate (10.90%) recorded early on 24th May, 2020. The need for long-term perspective while acknowledging the complexities of school re-openings was reiterated by Madam Giannini. She stressed the need for UNESCO member countries to work collaboratively and assiduously to enhance existing education systems; and to make them more resilient while bracing up for possible academic challenges that may arise in the near or distant future.

While re-opening of schools was being considered in some countries, nationwide school closures were taking effect in the United States during the research period. As of 10th April, 2020, schools in the District of Columbia, all the five inhabited territories, and most schools in the fifty (50) states were closed. In all, about one hundred and twenty-four (124) private and public schools were closed across the United States during the period. The school closures affected over 55.1 million learners. However, the school closures varied slightly; three territories and twenty-one (21) states announced school closures for the remainder of the academic year while adaption and implementation of distance and online learning as alternatives to learning in the physical classroom environment were strongly considered. However, the implementation of distance and online learning platforms was fraught with challenges; stakeholders raised legitimate concerns about how special needs learners could be accommodated. Further, they raised concerns about the issue of learners' absenteeism, access to computers and the Internet to facilitate learners' active participation and socio-academic benefits from distance and online learning platforms. School closures emanating from the Coronavirus pandemic were believed to be unprecedented in the United States; prior pandemics did not necessitate such massive school closures across the country. Disruptions in academic programmes by COVID-19 compelled school authorities in the United States to review and adjust requirements for graduation and grading scales. For instance, in spring 2020, the pass/fail grading system implemented by many institutions of higher learning was suspended.

Intervening measures introduced by the United States Department of Education to alleviate the plight of learners from the 'academic skirmishes' of COVID-19 were helpful. These included approval for College Board's replacement of traditional face-to-face *Advance Placement Examination* with an online examination; rescheduling of the *ACT Examinations* from April 2020 to June 2020; and cancellation of the *SAT* tests slated for March 2020 and May 2020. The novel arrangement allowed for the latter examination to be accessed and taken by learners from home. This was consistent with the alternative examination arrangements implemented in China at the peak of the COVID-19 outbreak. Further, states were allowed to opt out of standardised testing mandated by the *Acton Every Student Succeeds*. In the states of Washington and Florida, state testing for the 2019-2020 academic year was cancelled. The foregoing was consistent with measures taken by countries such as Vietnam, Japan, France, Spain, China, and Chile to reschedule or cancel national assessments and examinations for learners at all levels of the academic strata. In Thailand and Japan, modification of dates for certain national examinations was found to be very challenging; learners' participation in the examinations on the pre-determined date was inevitable. As a result, special arrangements were made to assure the health and safety of learners who participated in the examinations. This included limiting the number of learners who could sit for the examinations at a time (UNESCO, 2020b; Chang & Yano, 2020).

Guatemala introduced innovative measures, including the provision of guidelines to teachers and learning materials to caregivers and parents. These allowed continued interaction between instructors and learners offline. Comparatively, authorities in China allowed caregivers and parents to access pedagogical support online to facilitate learning among school children at home. Spain and Italy organised online courses for caregivers and parents, so the latter could ensure effective management of relationship with learners during school closures and lockdowns.

Spain developed and established apps and communication platforms, so the learning process could be co-built and shared among instructors, caregivers, and parents. In the wake of COVID-19, the 'academic burden' imposed on caregivers and parents by home and distance learning was found to be heavy. Many caregivers and parents assumed the new role of

'academic instructors' at home; a role most were not prepared for. Most caregivers and parents struggled to combine learning supervision and routine house chores. Caregivers and parents with limited formal education and those who completed their formal education several years ago, and had not been 'revising' their early school notes' had challenges assisting their wards during the school closures, and lockdown periods. However, some of these caregivers and parents were 'rescued' by their older children who had formal education; the latter facilitated the learning process of their younger siblings (Chang & Yano, 2020).

Learners from some families in the United States relied on food served in schools for daily sustenance. However, effective and full implementation of requirements of the United States Department of Agriculture for school lunch during the wave of the COVID-19 pandemic was a challenge. To ensure affected learners from deprived families were not denied the routine food supply, the United States Department of Agriculture waived many requirements; and special arrangements were made by several states and districts for lunch bags to be distributed on 'grab-and-go' bases. Further, pick-up of meals in bulk to limit the frequency of return and physical contact was encouraged in some districts. An alternative to the foregoing arrangement was the delivery of meals to learners through designated school bus routes. Similar arrangements were replicated in Argentina and Japan to ensure learners from deprived families were saved from food starvation. In China, learners who were compelled to stay in isolation in their respective schools at the outset and peak of the COVID-19 pandemic were constantly supplied with food. Authorities in the Autonomous Community of Catalonia in Spain issued redeemable credit cards to vulnerable children, so they could access nutritious meals from commercial food establishments (Chang & Yano, 2020).

4.5. Training and Licensing of Teachers

The current research revealed education ministries and school authorities in many countries across the globe had embraced the concept of teacher training and licensing as prerequisites for employment and appointment to public elementary and secondary schools. The severity of COVID-19 disrupted scheduled teacher training and dates for teacher licensing examinations in many countries. To ease the negative impact of COVID-19 on the foregoing, affected countries identified and implemented alternative measures. In the United Arab Emirates, novel technological arrangements were instituted to provide continuous specialised training for teaching and administrative staff on online basis. Similar arrangements were made in Chile to allow teachers and administrators who were deficient in digital skills training to improve on their deficiencies.

The Chilean government ensured webinars were organised regularly while teachers were encouraged to share good teaching methods and practices. Authorities in China postponed teacher qualification examinations while some training courses were made available online for already-qualified teachers due for refresher courses and continuous professional development. The Coronavirus pandemic affected teachers' ability to renew their teaching licenses in Japan. To mitigate the portentous effect of the pandemic on the teaching profession, the Japanese government issued temporary licenses to teachers who could not participate in the license renewal training. Issuance of the temporary certificate to teachers was on case-by-case basis (Chang & Yano, 2020).

One of the significant educational desiderata that resonated throughout the research was the need for the availability of reliable, accurate and valid data to facilitate decisions on providing support for learners and developing curricula that meet teaching and learning needs of contemporary times in post COVID-19 era. Access to reliable and accurate data to facilitate the development, adaption and implementation of practical educational policies in post COVID-19 period would help various countries and territories to equip themselves academically to withstand the rumbling tests of future epidemics and pandemics on education. Training and licensing could help countries and territories maintain research-oriented instructors to facilitate data collection and analysis in critical periods such as pandemic era. Indeed, the academic challenges emanating from COVID-19 compelled advanced, emerging, and developing economies to review their existing academic structures and media of instructions.

Generally, access to appropriate learning materials remained a challenge to many learners across the globe. Socio-economic inequality was identified as a major barrier to the successful implementation of distance and online learning programmes in many countries across the globe. To ease the challenge, it was imperative for less-endowed learners to be provided with the requisite technological assistance including access to the Internet and computers to ease their inclusion and active participation in organised distance and online learning programmes. Mathematics and reading emerged as some of the major subjects that pose 'threats' to learners at various academic levels. The study revealed learners at various levels struggle to cope with these two important subjects. Well-trained instructors could facilitate learners' ability to develop strong interests in hitherto 'uninteresting' subjects such as mathematics and reading.

During the COVID-19 outbreak, UNESCO was expected to live up to its international responsibility. That is, collect, analyse, and share policy measures rolled-out and implemented by member countries; and to advise and encourage member countries that were ill-prepared for the learning and academic challenges during the pandemic period. Effective assumption of the above-mentioned role by UNESCO could serve as an impetus to member countries; it could assist in critical decision making; facilitate continuity in learning; and encourage member countries to uphold the fundamental principles of equity and equality in education.

4.6. Implementation of Non-Pharmaceutical Measures

One of the identified non-pharmaceutical measures adapted by countries and territories with reported and potential cases of COVID-19 was school closures. This measure was adapted to ensure efficiency and effectiveness in the implementation of social and physical distancing as well as self-isolation and quarantine rules; enhance containment efforts while minimising spread of the deadly COVID-19 pandemic among learners, instructors and administrative staff;

and to prevent schools from being conduits for transmission of the pandemic to families and friends within and outside the schools. Implementation of school closures as a containment measure was found to be recent in some countries while implementation in others was in effect for several months.

Monitoring data released by the United Nations Education, Scientific and Cultural Organisation revealed as at 23rd March, 2020 more than one hundred and twenty-four (124) countries had implemented nationwide school closures. During the same period, the Nigerian government announced nationwide closures of schools, companies and markets; and parents prohibited their children and wards from stepping out of their homes. These closures which extended to several countries and territories impacted negatively on over 1.63 billion learners at various levels (crèche, primary, secondary, and tertiary levels), representing more than seventy per cent (70%) of the global learners' population. Table 9 in Appendix A presents comprehensive data on respective values for pre-primary through secondary levels, tertiary level, and total learners' populations for all the 108 countries included in the analysis.

Chang and Yano (2020) believed school closures as of 24th March, 2020 affected about 80% of the global learners' population. As of 4th May, 2020 over one hundred and seventy-seven (177) countries had implemented their respective measures and orders on nation-wide schools' closures. The population of learners affected during the period was equivalent to 1.268 billion, representing about 72.4% of the total learners' population across the global. This figure, however, excluded millions of additional learners who had been affected by school closures at the local level (UNESCO, 2020a). The unprecedented school closures brought undue challenges to bear on key stakeholders in education including caregivers, parents, learners, instructors, and governments; these key stakeholders were saddled with ensuring the continuity of learning in the midst of the COVID-19 pandemic. Figure 1 presents data on total learners in the 108 countries sampled for the current research. The data affirm the total number of learners affected in China, including Hong Kong and Macao (275,436,085) constituted the highest, and represented about 27.23% ($(275,436,085 \div 1,011,586,530) \times 100\% = 0.2722813 \times 100\% = 27.22813 = 27.23\%$) of the data on total learners' population (1,011,586,530) included in the research. The country with the least affected learners' population was Cayman Islands (9,182).

Strategic measures for containment and prevention of further spread of COVID-19 were implemented early by some countries. Separate reports by China Daily (2020) and RFE/RL (2020) revealed on 26th January, 2020, the Chinese government ordered nationwide school closures and extended the Spring Festival Holiday; and on 23rd February, 2020, the Iranian Ministry of Health announced the government's decision to close down schools at all levels in many cities and provinces across the country. The implemented interventions in China and Iran during the period had a common thread. That is, to complement the respective governments' efforts at stemming the spread of COVID-19 in their respective jurisdictions and beyond.

Earlier statistics released by UNESCO on 3rd March, 2020 indicated thirteen (13) countries were implementing temporary school closures at various educational levels as part of their preventive and containment measures and efforts. The estimated total number of learners negatively impacted during the period was 290.5 million. About 80.21% of the total number of learners affected during the period was Chinese students.

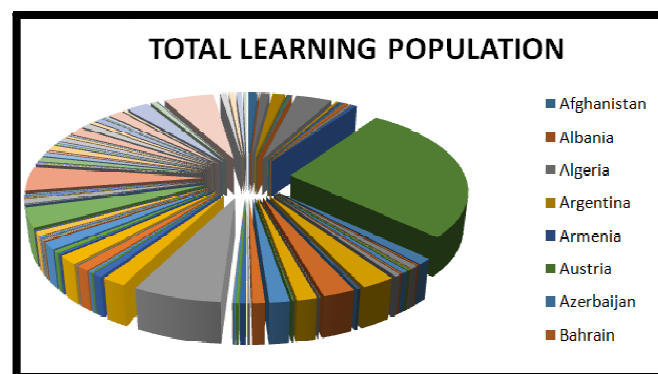


Figure 1: Total Learners' Populations for the 108 Countries

In quantitative terms, about two hundred and thirty-three (233) million Chinese learners were negatively impacted. Other countries with significant negative impacts during the period were Japan (16.5 million learners) and Iran (14.5 million learners). Data released by UNESCO (as cited in Web Archive, 2020a) on 10th March, 2020 revealed globally, the COVID-19 crisis compelled one in five learners to stay away from school; and one in four learners was denied access to academic institutions of higher learning. As at 16th March, 2020, the total number of countries implementing non-pharmaceutical interventions including nationwide and localised school closures had increased to seventy-three (73). Sensing 'steep academic danger,' UNESCO called on the implied economies to institute measures that would facilitate learning among the affected learners; and to provide other supports for the affected learners and their respective families. Some recommended measures by UNESCO to ensure uninterrupted studies included large-scale distance learning programmes (Web Archive, 2020a).

Respective school closures in Afghanistan and Albania affected a total of 9,979,405 and 652,592 learners. The affected learners in Afghanistan comprised 9,608,795 learners from pre-primary through secondary levels; and 370,610 tertiary-level learners. The respective total numbers of tertiary-level and pre-primary through secondary level learners impacted by the COVID-19 crisis in Albania were 131,833 and 520,759. The initial closure of schools in Albania was

intended for two weeks. However, as at 30th April, 2020, the respective total numbers of confirmed cases, deaths, recoveries, and active cases in the country were 766, 30, 455, and 281. The total number of confirmed cases (766) and deaths (30) was more than the total number of cases (51) and death (1) reported early on 17th March, 2020 (Worldometer, 2020b). Although Albania's total number of reported cases (766) during the period was low compared to total cases reported in Bosnia and Herzegovina (1,677), Estonia (1,666), and Slovenia (1,418), among others, the research revealed a sharp numerical increase (715) in newly-reported cases and deaths (29) during the period, implying the country's containment measures were minimising rapid spread, but not preventing spread. Thus, any decision to re-open schools 'hastily' during the period could have jeopardised the collective and considerable gains made in the relentless fight against the COVID-19 pandemic.

Statistical data on pre-primary through secondary education levels for the sampled research population is shown in Figure 2. Ethiopia has one of the largest learners' populations in Africa with a total learners' population of about 24,686,497. The total number of learners at the pre-primary through secondary levels in Ethiopia is 23,929,322. This is about 31.6 times the total number of learners (757,175) enrolled at the tertiary level in the country. As at 16th March, 2020, Ethiopia had closed all schools and imposed ban on public gatherings (BBC, 2020a). The total number of learners in Ethiopia (24,686,497) constitutes about 21.47% of the country's total estimated population of 114,963,588. The total number of learners is significant relative to the total Ethiopian population, implying the development of symptoms among the learning population could spread rapidly into various parts of the country. This could overstretch existing medical facilities and render containment measures ineffective.

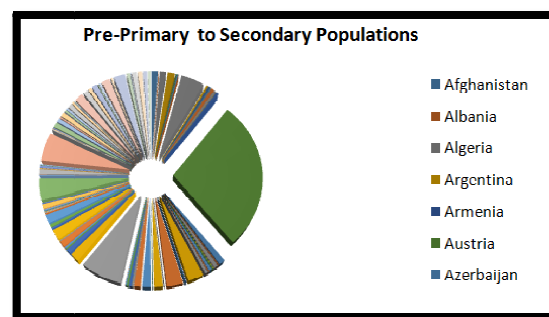


Figure 2: Pre-Primary - Secondary Levels Populations for the 108 Countries

Data on the respective total learners' populations for twenty-five (25) of the 108 countries sampled and included in the research analysis are shown in Table 1 and Figure 3. The countries were purposefully selected to represent the five major regions across the globe: *Africa, North America, South America, Europe, and Asia*. Data in Table 1 indicate each region has five representations. Africa is represented by Egypt, Ethiopia, South Africa, Ghana, and Gabon. The United States and the next four countries in the table represent North America while from Argentina through Ecuador reflect representations for South America. Europe is represented by France and the ensuing four countries while China and the rest of the countries in the table represent Asia.

The total learning population in Egypt (26,071,893) is equivalent to 25.56% $((26,071,893 \div 102,009,499) \times 100\% = 0.255583 \times 100\% = 25.5583 = 25.56\%)$ of the country's estimated total population of 102,009,499. As of 2nd May, 2020, Egypt remained the second most infected country in Africa with respective COVID-19 reported cases and deaths of 5,895 and 406; and the highest in the North African region. The total number of reported cases in Egypt (5,895) was 56 cases $(5,951 \text{ cases} - 5,895 \text{ cases})$ adrift of total cases reported in South Africa during the period. The latter remained the epicentre of COVID-19 in Africa. The first case of COVID-19 in Egypt was reported in mid-February 2020. Since then, the number of confirmed cases in the country kept surging. This raised legitimate concerns about uninterrupted nationwide academic programmes and further spread of COVID-19 in the country.

On 25th March, 2020 the foregoing compelled the Egyptian government to impose curfews, close down schools, and ban public gatherings as part of non-pharmaceutical interventions intended to protect the people; and to prevent further spread of the pandemic in the country. The analysis suggests quite a significant number of the Egyptian population (25.56%) is in the learning category. Thus, the country's containment efforts may be an exercise in futility if steps were not taken to prevent any possible spread through the schools. It is worth-emphasising school closures and ban on public gatherings have constituted an integral part of non-pharmaceutical interventions in the fight against epidemics and pandemics since time immemorial – the era of the Spanish flu (1918 to 1920) through the Swine flu (2009 to 2010).

Country	Pre-Primayto Secondary	Tertiary Level	Total Number of Learners
Egypt	23,157,420	2,914,473	26,071,893
Ethiopia	23,929,322	757,175	24,686,497
South Africa	13,496,529	1,116,017	14,612,546
Ghana	9,253,063	443,693	9,696,756
Gabon	468,362	10,076	478,438
United States*	-	-	55,100,000
Mexico	33,159,363	4,430,248	37,589,611
Costa Rica	1,100,782	216,700	1,317,482
Panama	837,246	161,102	998,348
Jamaica	552,619	74,537	627,156
Argentina	11,061,186	3,140,963	14,202,149
Colombia	9,124,862	2,408,041	11,532,903
Peru	8,015,606	1,895,907	9,911,513
Chile	3,652,100	1,238,992	4,891,092
Ecuador	4,462,460	320,765	4,783,225
France	12,929,509	2,532,831	15,462,340
Germany	12,291,001	3,091,694	15,382,695
Italy	9,039,741	1,837,051	10,876,792
Spain	7,696,101	2,010,183	9,706,284
Belgium	2,457,738	526,720	2,984,458
China**	233,169,621	42,266,464	275,436,085
Iran	14,561,998	4,073,827	18,635,825
Japan***	16,496,928	-	16,496,928
South Korea	7,044,963	3,136,395	10,181,358
Israel	2,271,426	210,041	2,481,467
Source: UNESCO			
*Available data on the United States exclude break downs			
**The data for China include Hong Kong and Macao			
***The data for Japan exclude tertiary level learners			

Table 1: Learners Affected by COVID-19 in 25 Selected Countries

Valuable data on tertiary level of education for the 108 countries included in the analysis are shared in Figure 4. As shown in Table 1 and Figure 3, available data on total learners (16,496,928) impacted by COVID-19 in Japan did not include data on affected tertiary students' population. The foregoing suggests the total number of learners affected by the pandemic in Japan may be in excess of the number shared in this research. However, the initial figure released by Japan and applied to this research may be accurate if school closures in the country were not extended to learners at the tertiary level. With the exception of Japan, China including Hong Kong and Macao (42,266,464), Iran (4,073,827), South Korea (3,136,395) and Israel (210,041) shared valuable data on tertiary level learners affected by the COVID-19 pandemic in the Asian region.

Severity of the impact of the 'unfortunate wind' of COVID-19 on academic programmes and activities in the West African Sub-region cannot be overemphasised. In Burkina Faso, about 4,686,723 learners were impacted by the COVID-19 debacle. These included 117,725 tertiary level and 4,568,998 learners from pre-primary through secondary levels. As part of measures aimed at stemming widespread of the COVID-19 pandemic in Ghana, the government led by Nana Addo Dankwa Akufo-Addo ordered nationwide school closures and ban on public gatherings. This intervention affected an estimated learning population of 9,696,756 comprising 443,693 tertiary level and 9,253,063 learners from pre-primary through secondary levels (UNESCO, 2020). Ghana's total population was estimated at 31,072,940 people during the period (Worldometer, 2020c). This implies total learners constitute about 31.21% of the total population. Like Ethiopia, Ghana's total learners-to-total population ratio (31.21%) is very significant; widespread eruption of the COVID-19 pandemic in Ghana could not be ruled out if the impact of school closures was underestimated; and the necessary COVID-19 protocols not duly observed and adhered to.

As of 23rd March, 2020, the respective Presidents of Côte d'Ivoire and Senegal had declared states of emergency and instituted measures for the imposition of hefty fines on violators of laid down procedures to curb further spread of the COVID-19 pandemic in their respective countries. During the period, Côte d'Ivoire and Senegal announced school closures. The orders on school closures affected estimated learning populations of 6,338,832 and 3,660,526 in Côte d'Ivoire and Senegal respectively. With an estimated total population of 26,266,101, Côte d'Ivoire had total learners-to-total population ratio equivalent to 24.13% $((6,338,832 \div 26,266,101) \times 100\% = 0.2413313 \times 100\% = 24.13313 = 24.13\%)$. The population of Senegal was estimated at 17,354,054 during the period. This translated into total learners-to-total population ratio of about 21.09% $((3,660,526 \div 17,354,054) \times 100\% = 0.210932 \times 100\% = 21.093204 = 21.09\%)$. As of 25th March, 2020, Côte d'Ivoire and Senegal had respective 73 and 99 confirmed cases with no deaths. However, the narratives were different as at 2nd May, 2020; the respective countries recorded 1,260 (1,333 cases - 73 cases) and 1,016 (1,115 cases - 99 cases) increases in reported cases; and respective deaths of 15 and 9.

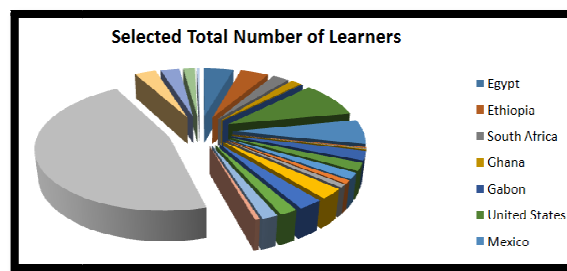


Figure 3: Learners Affected by COVID-19 in 25 Countries

Some analysts argued majority of COVID-19 victims were the elderly; the victims were mostly those who were sixty years and older; and that, the effect on the youth was very minimal. However, these proponents may be oblivious of how the immune system of most youth is able to combat 'foreign' bacteria or virus over a considerable period of time; and in some cases, their (youth's) immune system over-powers and kills the foreign bacteria (virus). The fact that a youth is asymptomatic that is, does not exhibit symptoms of COVID-19 does not mean the COVID-19 virus may not be present or 'resident' in his or her body. Further, the probability of both symptomatic and asymptomatic patients transmitting the virus to others remained very high. Besides, not every youth has a strong immune system; the COVID-19 virus can overpower the immune system of some youth as evidenced in the reported deaths of some persons in their thirties such as the thirty-year old Zimbabwean Broadcaster, Mr. ZororoMakamba who was confirmed dead from COVID-19 (Shaban, 2020a). Thus, early school re-openings, while the COVID-19 was gaining currency in infected and neighbouring countries did not only increase the likelihood of spreading the pandemic among learners, instructors, administrative staff, family members, and friends, but also increased the chances of continent-wide and worldwide second wave of outbreaks.

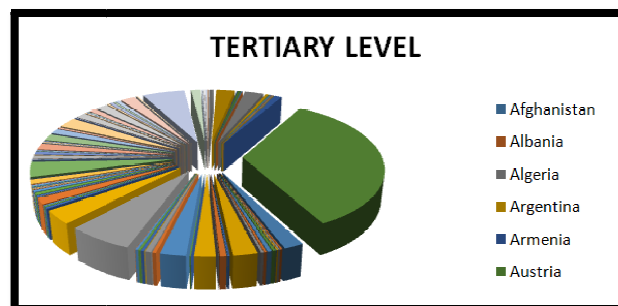


Figure 4: Tertiary Level Populations for the 108 Countries

The total number of learners impacted by the COVID-19 crisis in Argentina was 14,202,149 comprising 3,140,963 tertiary level and 11,061,186 learners from pre-primary through secondary levels. Argentina's estimated total population of 45,195,774 was equivalent to 0.58% ($45.196 \text{ million} \div 7.8 \text{ billion} \times 100\% = 0.005794 \times 100 = 0.5794 = 0.58\%$) of the global estimated total population of 7.8 billion during the period. The total learners' population in Argentina (14,202,149) was significant (31.42%) relative to the total population (45,195,774). The respective total numbers of confirmed cases (4,532) and deaths (229) in Argentina as at 2nd May, 2020 were by far, higher than the respective numbers (65) and (2) recorded early on 17th March, 2020. The study showed additional 4,467 cases (4,532 cases – 65 cases); and 227 additional deaths (229 deaths – 2 deaths) were reported during the period. The respective increases in reported cases and deaths in Argentina did not compare with the respective increases (92,396 and 6,434) in Brazil during the period. This notwithstanding, the case fatality ratio in Argentina increased from 3.08% to 5.05% while the number of reported cases increased by about 6,872% [$(4,532 \text{ cases} - 65 \text{ cases}) \div 65 \text{ cases} \times 100\% = (4,467 \text{ cases} \div 65 \text{ cases}) \times 100\% = 68.7230777 \times 100\% = 6,872.30777 = 6,872\%$]. The significance of Argentina's total learning population relative to the total national population (31.42%) coupled with the rate of reported cases (6,782%) justified school closures during the period; and affirmed the need for school re-opening to be contingent on a number of factors, including careful observation of progress in preventive and containment measures in the country; and in neighbouring countries since education in most cases, has inter-country affects ostensibly due to the admission of international students.

The COVID-19 outbreak compelled the Chilean government to order school closures across the country. The closures affected an estimated learning population of 4,891,092 in the country. This included 3,652,100 learners from pre-primary through secondary levels; and 1,238,992 tertiary level learners. Chile had an estimated total population of 17,595,865, implying total learners-to-total population ratio of about 27.80% [$(4,891,092 \div 17,595,865) \times 100\% = 0.277968 \times 100\% = 27.80\%$] during the period. Between 17th March, 2020 and 2nd May, 2020, the respective total number of confirmed cases and deaths in the country increased by 18,279 (18,435 cases – 156 cases) and 247 (247 deaths – 0 death). Again, the rising numbers of cases in Brazil (92,630), Chile (18,435), Argentina (4,532), and in other parts of the world, affirmed the World Health Organisation's warnings that the unfortunate wind of COVID-19 was blowing towards South and Central America, Eastern Europe and Africa; and the urgent need for countries in the afore-mentioned regions and continent to loin their girds to avert catastrophic consequences.

The People's Republic of China, Hong Kong and Macao had a total learning population of about 237,396,085 made up of 42,266,464 tertiary level and 233,169,621 learners from pre-primary through secondary levels. This total learners'

population was affected by early school closures. Details of these data are presented in Figures 1, 2, 3 and 4; Tables 1 and 2; and in Appendix A. Earlier reports indicated China was the first country to order nationwide school closures as part of her preventive and containment measures. The closures compelled about 200 million learners to continue their education online. As of 13th March, 2020, gradual re-opening of schools had begun in China; albeit, most schools remained closed during the period.

Separate studies conducted by Zumla, Yew, Wing-Wai and David (2010); and Cauchemez, Ferguson, Neil, Wachtel, Tegnell, Saour et al. (2009) revealed generally, governments' decision to close down schools helps to mitigate the spread of pandemics. However, the effectiveness of this measure hinges essentially on the contacts learners maintain during school closures. Simon (2020) and Barnum (2020) acknowledged the usefulness of school closures as a preventive measure, but noted the essence and significance of school closures are predicated on timing; and that, late decision to close schools would not yield the desired impact; learners, instructors and administrative staff risk being infected; and these infected people would in turn serve as carriers of the virus to their respective homes, dwelling places, and social gathering centres. The end result may be uncontrollable widespread. Recent happenings in countries such as the United States, Spain, Italy, and South Africa, to mention a few, in relation to COVID-19 strongly corroborated the foregoing assertion. As at 4th March, 2020, the total number of reported deaths from COVID-19 in Italy was over one hundred (100). It was during this period that the Italian government ordered full closure of schools at all levels throughout the country. Italy became one of twenty-two (22) economies on three distinct continents to institute nationwide school closures during the period (Web Archive, 2020a&b). The end-result however, was enormous challenges to effective containment of the pandemic outbreak in the country. As at 30th April, 2020, the respective total numbers of confirmed cases and deaths in Italy were 203,591 and 27,682.

During the period, Italy remained the third country with the highest number of confirmed cases; and second country with the highest number of confirmed deaths after the United States among two hundred and ten (210) countries and territories around the world. The country's case fatality ratio (13.60%) was about twice the global average (7.07%); and ranked second with the highest number of reported COVID-19 cases in Europe after Spain. The study revealed prompt closure of schools prior to outbreaks tended to be most effective. For instance, the United States' decision to adapt ban on gatherings and school closures as strong non-pharmaceutical interventions helped to mitigate spread of the Spanish flu pandemic between 1918 and 1920; and to reduce considerably the case fatality rate. However, the country's decision to delay these non-pharmaceutical measures during the COVID-19 outbreak resulted in significant number of human casualties in the country. For instance, nationwide closures of one hundred and twenty-four thousand (124,000) public and private schools in the United States were reported as at 10th March, 2020. The school closures affected an estimated learners' population of 55.1 million.

The closures affected most academic institutions in the five United States' inhabited territories, the District of Columbia and the fifty (50) states. Reports indicated three United States' territories and twenty-one (21) states closed their respective school buildings for the remainder of the (2020) academic year. The total estimated number of affected learners (55.1 million) constituted about 16.65% ($55.1 \text{ million} \div 331 \text{ million} \times 100\% = 0.166465 \times 100\% = 16.6465 = 16.65\%$) of the United States' estimated total population of 331 million. The fact that most schools were closed implied not all schools were closed during the period. The decision to restrict learners to their respective homes at the peak of the pandemic outbreak and not earlier might have exacerbated widespread and weakened preventive and containment efforts. The negative effect of late implementation of school closures as a major preventive measure was evidenced in the overwhelming total number of reported COVID-19 cases in the United States.

Available data from Worldometer (2020b) revealed as at 30th April, 2020, the United States was the epicentre of COVID-19 throughout the world with respective reported cases and deaths of 1,064,572 and 61,669. The number of reported cases in the United States was equivalent to 32.95% of the total cases (3,230,490) reported globally while the total number of deaths (61,669) in the country represented about 27% of all COVID-19 deaths (228,398) reported globally during the period. Further statistics released by Worldometer (2020b) indicated as of 24th October, 2020 COVID-19 infections had been reported in 215 countries and territories; and in two international conveyances across the globe. The United States remained the epicentre of COVID-19 with respective 8,765,712 reported cases, 229,505 reported deaths, and 5,704,352 recoveries. The total number of reported cases in the United States (8,765,712) constituted about 20.54% of total cases reported globally (42,686,046) while reported deaths (229,505) represented about 19.93% of total deaths confirmed globally (1,151,811). Although the respective country-to-global ratios of reported cases and deaths decreased from 32.95% to 20.54%, and from 27% to 19.93%, the United States witnessed significant surge in reported cases (about 723.40%) and deaths (about 272.16%) during the period under review. The United States has an estimated total learners' population of 76 million (Psacharopoulos et al.). Cities in the United States that resorted to early implementation of the non-pharmaceutical measures during the Spanish flu outbreak experienced significant delays in the record of high case fatality rates, vice versa. Nonetheless, school authorities' decision not to delay re-opening, but concern themselves integrally with possible disruptions in their respective academic calendars and therefore re-opened on due or proposed dates recorded significant increase in confirmed cases and fatalities. The measurement of impact of school closures on the fight against pandemics is pivotal to determination of school closure's relevance as a useful intervention tool.

However, Jackson, Vynnycky, Hawker, Olowokure and Mangtani (2013) found in most cases, school closures and ban on public gatherings are implemented concurrently; and this makes it a bit challenging to assess the real contribution of school closures to the containment efforts. The foregoing notwithstanding, the contribution of school closures to responsive and preventive measures related to epidemic and pandemic outbreaks cannot be underestimated. As noted earlier, any decision to re-open schools in Ethiopia during the research period would imply the possibility of spreading the COVID-19 virus through an estimated 21.47% of the total population. Nurturing of similar idea in Ghana could increase the

chances of spreading the virus quickly through an estimated 31.21% of the country's total population. The foregoing permutations hold strong for all countries and territories with reported and potential cases of the COVID-19 pandemic.

Findings from the research revealed as of February 2020, over one million students at the primary and secondary levels were already enrolled, and participated in virtual classes in Wuhan City in Hubei Province in the People's Republic of China. Virus-related topics were introduced in addition to the regular subjects to 'enrich' the school curricula. In Turin, Italy, schools were assisted to transition from the physical learning to online learning environment. This seismic-shift-system had its attendant problems ranging from technical issues to training of instructors to be abreast of modern technology and usage in imparting knowledge and skill to students. However, some schools with no prior experience in distance and online learning were able to address their respective challenges to facilitate implementation of same. A major gap created by the online learning platform included inability of children who hitherto benefitted from school feeding programmes to access their meals. Identifying and implementing alternative strategies to address the basic social needs of children were identified as a major concern to school authorities in São Paulo, Brazil (Atchoarena, 2020). However, it is hoped synthesis of strategies adapted and implemented by different countries and territories in various regions across the globe and presented in this research would serve as a useful prototype to the school authorities in São Paulo, Brazil.

Atchoarena (2020) revealed prior to outbreak of the COVID-19 pandemic, distance and online learning options were not strongly considered by many countries and territories across the globe. However, given the severity of the pandemic outbreak, governments around the world were impelled to review existing methods of teaching and learning to include distance and online learning options. Distance and online learning have become inevitable not only in the advancement of academic programmes and activities but also inevitable in the professional world. The need for single parents, family men and women, and workers to further their education to better their academic credentials to enhance opportunities for promotion, decent and increased remuneration makes it imperative for most individuals in the foregoing categories to enrol in distance and online academic programmes.

Extant research unearthed concerns about fairness in the conduct of examinations through distance and online portals. However, committed students who enrol in distance and online academic programmes tend to accept the challenge, learn studiously and excel in their academic pursuits. Indeed, epidemics and pandemics are reshaping the earth and academic activities therein. The evidence suggests distance and online learning may dominate academic activities in the 21st century and beyond, especially when scientists have not been able to predict non-occurrence of epidemics and pandemics in the near and distant future, but rather, have warned of potential pandemic outbreaks at short intervals compared with outbreaks about a century ago. Atchoarena (2020) noted local governments' decisions to set up collaboration platforms and virtual classrooms at a very fast pace to avert potential disruptions in planned educational activities for learners during the pandemic period.

4.7. Descriptive Statistics

A statistical description of the total learners' population for each of the 108 countries included in the analysis is presented in Table 2. Analysis in this section drew on the data in Table 4, column 2. The figure indicates the respective sample variance (7.94325) and skewness (8.174115) for the distribution. Skewness explains the distortion or asymmetry of the random variable around the mean in the distribution. The statistical data depict respective Kurtosis and standard error values of 75.748975 and 2711984.136. The extent to which the coefficients are significantly different from zero is explained by the standard error value. The minimum value in the figure is 9182. This represents total learners' population value for Cayman Islands.

Mean	9366541.944
Standard Error	2711984.136
Median	2428342
Mode	396782
Standard Deviation	28183765.88
Sample Variance	7.94325E+14
Kurtosis	75.74897528
Skewness	8.174115111
Range	275426903
Minimum	9182
Maximum	275436085
Sum	1011586530
Count	108
Largest(1)	275436085
Smallest(1)	9182
Mean	3540.35

Table 2: Total Learners' Population for Selected Economies

The maximum value (275436085) is representative of the total learners' population for China, including Hong Kong and Macao. The range explains the difference between the maximum and minimum values for the distribution. Value for the *range* (275426903) explains the substantial difference (275,426,903) between the respective total learners' population values for China, including Hong Kong and Macao (275,436,085) and Cayman Islands (9,182) during the

research period. The value for sum (1,011,586,530) in Table 2 depicts the total number of learners included in the analysis. This value is significant relative to the estimated total number of learners across the globe.

It is worth reiterating a significant proportion of the total global population is contributed by the 108 countries included in the analysis. As a result, another descriptive statistical test was conducted to ascertain the magnitude of the total population values for the sampled economies during the period. The population data in Table 4, column 3 were used for the analysis in this section. Table 3 presents a statistical description for measures of central tendency such as the mean, median, and mode; and measures of dispersion such as the range, minimum, maximum, and standard deviation (Ashley et al.; Frankfort-Nachmias and Nachmias, 2008) for the total population values used in the research.

Mean	44009699.73
Standard Error	14043522.13
Median	10566017.5
Mode	#N/A
Standard Deviation	145944563.1
Sample Variance	2.12998E+16
Kurtosis	81.68638723
Skewness	8.594030212
Range	1447404370
Minimum	65722
Maximum	1447470092
Sum	4753047571
Count	108
Largest(1)	1447470092
Smallest(1)	65722
Mean	50.80553333

Table 3: Total Populations for Selected Economies

Table 3 presents the respective highest (1,447,470,092) and lowest (65,722) total national population values recorded during the research period. The highest value represents the total populations for China, including Hong Kong and Macao while the lowest reflects the total population value for Cayman Islands. The *range* of total population values during the period is 1447404370 (1,447,404,370). This represents the difference between the highest (1,447,470,092) and lowest (65,722) total population recorded values during the period.

Results in Table 3 depict respective *mean* and *median* of 50.8055 and 10566017.5; and standard deviation of 145944563.1. These tell us the extent to which the observations were dispersed around the central tendency. The *mode* explains the variable with the highest frequency or number of occurrences in the data. The figure shows no absolute value (#N/A) for the mode. This implies no total national population value was repeated, that is, there were no two or more countries with the same total national population values during the period. Coincidentally, a significant number if not all of the 108 countries included in the analysis were most affected by the COVID-19 outbreak. This raised concerns about the possibility of meeting universal targets for educational programmes and activities in 2020.

4.8. Results

The objective of this research was to test the underlying hypothesis that is, measure the extent to which a given total learners' population significantly influences total national population value. Statistics in column 2, Table 4, depict the respective total learners' population values for the 108 economies sampled for the current research. Data in the table show countries such as China, including Hong Kong and Macao (275,436,085), Indonesia (68,265,787), United States (55,100,000), Pakistan (46,803,407), and Bangladesh (39,936,843) have fairly large total learners' population values affected by COVID-19. Column 3 in the table presents the respective total national population values for the sampled population. Data used in this section were obtained from the databases of UNESCO and Worldometer. Causal relationship between the independent variable (total learners' population) and the dependent variable (total national population) was tested using regression analytical tools. Results from the analysis are presented in the following section.

Country	Total Learners' Population	Total National Population
Afghanistan	9,979,405	38,928,346
Albania	652,592	2,877,797
Algeria	10,236,182	43,851,044
Argentina	14,202,149	45,195,774
Armenia	540,503	2,963,243
Austria	1,708,540	9,006,398
Azerbaijan	1,983,999	10,139,177
Bahrain	292,429	1,701,575
Bangladesh	39,936,843	164,689,383
Belgium	2,984,458	11,589,623
Bolivia*	2,612,837	11,673,021
Bosnia and Herzegovina	523,241	3,280,819
Bulgaria	1,224,406	6,948,445
Burkina Faso	4,686,723	20,903,273
Cambodia	3,522,262	16,718,965
Cayman Islands*	9,182	65,722
Chile	4,891,092	19,116,201
China**	275,436,085	1,447,470,092
Colombia	11,532,903	50,882,891
Costa Rica	1,317,482	5,094,118
Côte d'Ivoire	6,338,832	26,378,274
Croatia	787,188	4,105,267
Cyprus	180,617	1,207,359
Czech Republic	2,068,763	10,708,981
D. P. Republic of Korea	4,755,570	51,269,185
Denmark	1,497,943	5,792,202
Ecuador	4,783,225	17,643,054
Egypt	26,071,893	102,334,404
El Salvador	1,604,845	6,486,205
Equatorial Guinea*	160,019	1,402,985
Estonia	272,781	1,326,535
Ethiopia	24,686,497	114,963,588
Fiji	453,894	896,445
France	15,462,340	65,273,511
Gabon	478,438	2,225,734
Georgia	883,677	3,989,167
Germany	15,382,695	83,783,942
Ghana	9,696,756	31,072,940
Greece	2,204,532	10,423,054
Grenada	35,288	112,523
Guatemala	4,559,618	17,915,568
Honduras	2,285,249	9,904,607
Hungary	1,791,758	9,660,351
Iceland	98,224	341,243
Indonesia	68,265,787	273,523,615
Iran	18,635,825	83,992,949
Iraq	7,435,696	40,222,493
Ireland	1,319,122	4,937,786
Israel	2,481,467	8,655,535
Italy	10,876,792	60,461,826
Jamaica	627,156	2,961,167
Japan*	16,496,928	126,476,461
Jordan	2,372,736	10,203,134
Kazakhstan	5,060,284	18,776,707
Kenya	14,314,351	53,771,296
Kuwait	749,324	4,270,571
Kyrgyzstan	1,661,618	6,524,195
Latvia	396,782	1,886,198
Lebanon	1,363,393	6,825,445
Lesotho	396,782	2,142,249

Country	Total Learners' Population	Total National Population
Libya	1,885,226	6,871,292
Lithuania	586,120	2,722,289
Luxembourg	109,897	625,978
Malaysia	7,962,033	32,365,999
Mauritania	947,589	4,649,658
Mexico	37,589,611	128,932,753
Mongolia	1,026,210	3,278,290
Montenegro	135,689	628,066
Morocco	8,943,156	36,910,560
Namibia	745,566	2,540,905
Netherlands	4,211,999	17,134,872
North Macedonia	359,623	2,083,374
Norway	1,357,563	5,421,241
Pakistan	46,803,407	220,892,340
Palestine	1,626,357	5,101,414
Panama	998,348	4,314,767
Paraguay	1,744,889	7,132,538
Peru	9,911,513	32,971,854
Poland	7,553,488	37,846,611
Portugal	2,375,217	10,196,709
Qatar	343,524	2,881,053
Republic of Korea	10,181,358	25,778,816
Republic of Moldova	586,158	4,033,963
Romania	2,951,879	19,237,691
Rwanda	3,464,409	12,952,218
Saint Lucia	33,162	183,627
Saudi Arabia	8,410,264	34,813,871
Senegal	3,660,526	16,743,927
Serbia	1,220,968	8,737,371
Slovakia	988,103	5,459,642
Slovenia	412,224	2,078,938
South Africa	14,612,546	59,308,690
Spain	9,706,284	46,754,778
Sri Lanka	5,218,372	21,413,249
Sudan	8,824,167	43,849,260
Switzerland	1,589,837	8,654,622
Syrian Arab Republic	4,188,528	17,500,658
Thailand	15,401,441	69,799,978
Trinidad and Tobago	277,190	1,399,488
Tunisia	2,751,424	11,818,619
Turkey	24,901,925	84,339,067
Ukraine	6,785,004	43,733,762
United Arab Emirates	1,362,359	9,890,402
United States*	55,100,000	331,002,651
Uzbekistan	7,474,117	33,469,203
Venezuela*	6,866,822	28,435,940
Yemen	6,119,823	29,825,964
Zambia	4,012,617	18,383,955

Table 4: Data on Total Learners and Total Population for Selected Global Economies
Data Sources: UNESCO (2020) & Worldometer(2020)

4.8.1. Test of Hypotheses

The alternative hypothesis underlying the research in section 3.4 sought to test whether or not a given total learners' population has strong influence on total national population during pandemic outbreaks. Outputs from the statistical analysis on the research hypothesis are presented in the following section.

4.8.2. Model Summary

Regression analysis outputs on the research hypothesis are presented in Tables 3 through 6 and in Figures 4 and 5 in the main text; and in Table 10 in Appendix E. Summary constitutes an important aspect of a regression model. Table 5 presents an overall description of the regression model. Values for R, R², and adjusted R² are displayed in the table. Value

of the multiple correlation coefficients between the independent variable (total learners' population) and the dependent variable (total national population) is presented in the R row. The R^2 value tells us the extent to which variability in the dependent variable is accounted for by the independent variable. The R^2 value implies total learners' population accounts for about 98.97% ($0.989684605 \times 100\% = 98.96846\% = 98.97\%$) of the variation in total national population values. The results suggest less than 2% ($100\% - 98.97\% = 1.03\%$) of the outcome is explained by external random factors.

The extent of influence of total learners on total national population suggests continuous school openings during the COVID-19 outbreak; and re-openings after school closures occasioned by COVID-19 without recourse to efficient and effective implementation of pharmaceutical and non-pharmaceutical interventions and protocols could trigger further spread of the virus within and across borders. It could severely undermine containment efforts of infected countries and territories; and serve as a potential for second wave of the pandemic across the globe. The outcome suggests economies that resorted to early nationwide school closures were more likely to be successful in their respective fights against COVID-19 than those who did not. Further analysis in the following section would help determine and accentuate the significance of the independent variable's (total learners' population) influence on the dependent variable (total national population).

Regression Statistics	
Multiple R	0.994828933
R Square	0.989684605
Adjusted R Square	0.98958729
Standard Error	14892575.43
Observations	108

Table 5: Summary Output

One of the measures that determine the generalisability of the regression model is the adjusted R^2 . Generally, an ideal adjusted R^2 value is closer to zero or the R^2 value. The adjusted R^2 value (0.98958729) in Table 5 is not significantly different from the observed value of R^2 (0.989684605). This implies the cross-validity of the regression model is good; the model may accurately predict the same dependent variable from the given independent variable in a different group of participants (Field, 2009). The R^2 significance was computed using an F-ratio. The ideal F-ratio formula for measuring R^2 significance is:

$$F = \frac{(N - k - 1) R^2}{k (1 - R^2)}$$

Where:

R^2 = Unadjusted value

N = Number of cases, participants or observations in the study

k = Number of independent variables in the regression model

Value for the F-ratio was determined as follows:

$$\begin{aligned} F &= \frac{(108 - 1 - 1) 0.989684605}{1 (1 - 0.989684605)} \\ &= \frac{104.90656813}{0.010315395} \\ &= 10169.90315 \end{aligned}$$

Our computations revealed the change in the amount of variance that can be explained gives rise to an F-ratio of 10169.90315, which is equivalent to the F-value (10169.903) in Table 6. This F-ratio shows a significant value ($p = 0.006$, $p < 0.05$) as presented in Table 7.

4.8.3. ANOVA

In general, the ANOVA helps to determine whether or not regression analysis provides better and significant prediction for the outcome than the mean. Data in Table 6 show degrees of freedom (between) of 1 ($2 - 1 = 1$); degrees of freedom (within) of 106 ($108 - 2 = 106$); total degrees of freedom (df) of 107 ($108 - 1 = 107$), and an F-value of 10169.903.

	df	SS	MS	F	Significance F
Regression	1	2.25557E+	2.25557E+	10169.903	4.0292E-107
Residual	106	2.35096E+	2.21789E+		
Total	107	2.27908E+18			

Table 6: ANOVA

Statistics in Table 6 depict the model sum of squares (SSM) value, represented by *Regression*; the residual sum of squares (SSR) value, represented by *Residual*; the total sum of squares (SST) value, represented by *Total*; and the degrees of freedom (df) for each group of squares. The degree of freedom for the SSM is 1, comprising the one independent variable (total learners' population). The sum of squares divided by the degrees of freedom gives us the mean squares (MS). That is, $2.255570646040280000 \div 1 = 2.255570646040280000 = 2.25557$; and $23509613099583500 \div 106 = 2.21789$.

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	-4242441.24	1510806.812	-2.8080634	0.005934	-7237762.7	-1247120
X Variable 1	5.151542721	0.051083294	100.84594	4.03E-107	5.0502651	5.2528203

Table 7: Model Parameters

4.8.4. Model Parameters

A normal probability plot on the relationship between total learners' population (TLP) and total national population (TNP) values is presented in Figure 5. The figure depicts prolonged flat-shape and steady rise in comparative values over the research period. Table 7 presents results on the parameters of the regression model. Data in the table show the coefficients, standard error, test statistic, significance, and confidence intervals for the coefficients. The coefficients hint us on the contribution of the independent variable (total learners' population) to the regression model. Generally, a positive coefficient connotes a positive relationship between the independent variable and the dependent variable; a negative value symbolises a negative relationship between the two variables. Results in Table 7 show a positive coefficient value (5.151542721). This means there is a positive relationship between total learners' population and total national population.

Relationship between the two variables (independent and dependent variables) is significant ($p = 0.006$, $p < 0.05$); the results suggest total learners' population has significant influence on total national population. Thus, total learners' population suffices to determine the extent to which pandemics such as COVID-19, controlling for other internal and external environmental factors such as Tsunamis, tornadoes, hurricanes, bushfires, volcanic eruptions, and others, could disrupt planned academic programmes and activities in economies across the globe. The foregoing was justified by the portentous disruptions caused in global education programmes and activities in 2020 by the COVID-19 outbreak. Re-opening dates for educational programmes and activities in the current academic year have been reviewed severally by different countries and territories in different regions across the globe. The study revealed countries such as the United States, China, France, Germany, United Kingdom, Italy, Turkey, Brazil, Netherlands, and Switzerland were among those infected with COVID-19 during the period. The overwhelming effect of pandemics such as COVID-19 on global education is dependent on a number of factors. These include responsive and preventive measures; the speed of spread; number of infected countries and containment measures; number of reported cases in each infected country and territory; case fatality ratio; and the extent of socio-economic disruptions caused by the pandemic outbreak to global academic programmes and activities, among others.

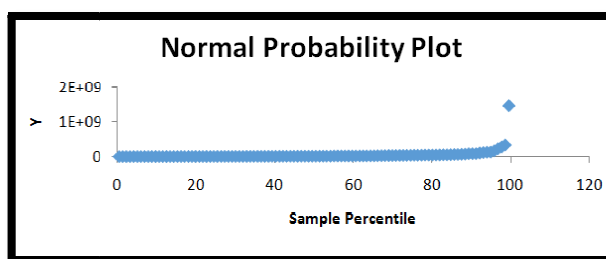


Figure 5: Normal Probability Plot for TLP and TNP

The magnitude of the t-test ($p = 0.006$, $p < 0.05$) in Table 7 tells us the independent variable (total learners' population) has strong influence on the dependent variable (total national population). A standard error is identified with the coefficients in the table. The standard error shows the extent to which the coefficients would vary in different research samples (Field, 2009). The table shows respective Upper 95% values for the *Intercept* (-1247119.79383143) and *X Variable 1* (5.25282032028844).

4.8.5. Test of Assumptions

Statistical tests were conducted to determine the linearity of the relationship between the independent variable (total learners' population) and the dependent variable (total national population); and to measure the variance in residual values. The statistical outputs are presented in Figure 6 and Table 8. The scatter plots in Figure 6 are on a straight line. This affirms the relationship between the independent variable and dependent variable is linear; it implies the model fits the analysis. The probability output derived from the regression analysis is presented in Table 10 in Appendix B.

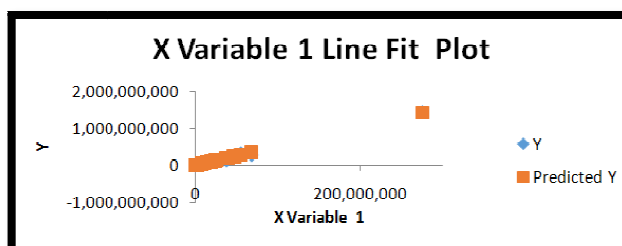


Figure 6: Linear Relationship between X and Y Variables

The *residual* values in Table 8 allow us to test the *homoscedasticity* of the model. That is, to test whether or not the residual values at each level of the independent variable depict constant variance. Residuals in Table 8 show constant variance values; this implies the assumption of homoscedasticity is met. Further, data in Figure 6 indicate relationship between the X and Y variables were measured at the interval level and beyond while variability of the dependent variable (total national population) was not constrained. The foregoing analysis indicates most of the assumptions have been met; this renders the regression model fit and appropriate for the research.

Observation	Predicted Y	Residuals	Standard Residuals
1	47166889.94	-8238543.944	-0.555801367
2	-880585.6742	3758382.674	0.253553813
3	48489687.63	-4638643.629	-0.312939336
4	68920536.06	-23724762.06	-1.600556514
5	-1458016.946	4421259.946	0.298273862
6	4559175.559	4447222.441	0.300025384
7	5978214.365	4160962.635	0.280713283
8	-2735980.755	4437555.755	0.299373235
9	201493911.6	-36804528.61	-2.482963912
10	11132121.64	457501.356	0.030864663
11	9217700.187	2455320.813	0.165644642
12	-1546942.877	4827761.877	0.325697923
13	2065138.575	4883306.425	0.329445155
14	19901412.51	1001860.486	0.067589058
15	13902641.93	2816323.075	0.189999134
16	-4195139.776	4260861.776	0.287452833
17	20954228.15	-1838027.148	-0.123999824
18	1414678317	32791774.52	2.212249303
19	55169801.26	-4286910.258	-0.289210156
20	2544623.565	2549494.435	0.171997928
21	28412322.61	-2034048.607	-0.137224126
22	-187208.6301	4292475.63	0.289585616
23	-3311985.05	4519344.05	0.304890963
24	6414879.732	4294101.268	0.289695287
25	20256080.78	31013104.22	2.092253902
26	3474276.116	2317925.884	0.156375493
27	20398546.69	-2755492.689	-0.185895301
28	130068029.4	-27733625.36	-1.871008638
29	4024986.336	2461218.664	0.166042532
30	-3418096.527	4821081.527	0.325247243
31	-2837198.267	4163733.267	0.2809002
32	122931102.7	-7967514.681	-0.537516772
33	-1904186.91	2800631.91	0.188940552
34	75412463.83	-10138952.83	-0.684009684
35	-1777747.445	4003481.445	0.270089044
36	309858.5754	3679308.425	0.248219184
37	75002169.21	8781772.788	0.592449509
38	45710811.55	-14637871.55	-0.987522682
39	7114299.536	3308754.464	0.2232203
40	-4060653.602	4173176.602	0.281537281
41	19246625.68	-1331057.676	-0.089797867
42	7530116.61	2374490.39	0.160191535
43	4987876.641	4672474.359	0.315221677
44	-3736436.109	4077679.109	0.275094681
45	347431676.9	-73908061.86	-4.986099737
46	91760807.38	-7767858.383	-0.524047251
47	34062864.36	6159628.639	0.415550374
48	2553072.095	2384713.905	0.16088125
49	8540942.019	114592.9807	0.007730849
50	51789817.41	8672008.588	0.585044428
51	-1011620.315	3972787.315	0.268018309
52	80742188.11	45734272.89	3.085396103

Observation	Predicted Y	Residuals	Standard Residuals
54	21825827.96	-3049120.964	-0.205704504
55	69498549.46	-15727253.46	-1.061016246
56	-382266.6437	4652837.644	0.313896914
57	4317454.871	2206740.129	0.148874508
58	-2198401.818	4084599.818	0.275561577
59	2781136.043	4044308.957	0.272843413
60	-2198401.818	4340650.818	0.292835685
61	5469381.036	1401910.964	0.094577881
62	-1223019.022	3945308.022	0.266164459
63	-3676302.151	4302280.151	0.290247064
64	36774311.9	-4408312.902	-0.297400409
65	639103.9738	4010554.026	0.270566186
66	189402045.7	-60469292.68	-4.07947275
67	1044123.414	2234166.586	0.150724794
68	-3543433.561	4171499.561	0.281424142
69	41828608.95	-4918048.951	-0.331789009
70	-401626.1413	2942531.141	0.198513577
71	17455851.55	-320979.547	-0.021654418
72	-2389827.994	4473201.994	0.301778057
73	2751102.549	2670138.451	0.180137001
74	236867309.4	-15974969.4	-1.077728041
75	4135806.323	965607.6767	0.065143315
76	900591.1308	3414175.869	0.230332402
77	4746428.985	2386109.015	0.160975369
78	46817141.41	-13845287.41	-0.934052148
79	34669674.88	3176936.118	0.214327368
80	7993590.605	2203118.395	0.148630173
81	-2472762.68	5353815.68	0.361187376
82	48207259.45	-22428443.45	-1.513102268
83	-1222823.263	5256786.263	0.354641428
84	10964289.53	8273401.466	0.558152979
85	13604609.72	-652391.7244	-0.044012657
86	-4071605.782	4255232.782	0.287073081
87	39083393.05	-4269522.048	-0.288037086
88	14614914.83	2129012.172	0.143630705
89	2047427.571	6689943.429	0.451327289
90	847813.5756	4611828.424	0.311130287
91	-2118851.695	4197789.695	0.283197767
92	71034713.74	-11726023.74	-0.791079111
93	45759895.44	994882.5553	0.067118302
94	22640225.05	-1226976.05	-0.082776152
95	41215632.03	2633627.966	0.177673875
96	3947671.983	4706950.017	0.317547527
97	17334939.69	165718.3122	0.011179945
98	75098740.03	-5298762.032	-0.357473262
99	-2814485.115	4213973.115	0.284289558
100	9931637.038	1886981.962	0.127302489
101	124040889.2	-39701822.23	-2.678425606
102	30710796.73	13022965.27	0.878575383
103	2775809.348	7114592.652	0.47997563
104	279607562.7	51395088.33	3.467294771
105	34260791.78	-791588.7843	-0.053403384
106	31132285.65	-2696345.648	-0.181905032
107	27284088.39	2541875.613	0.171483936
108	16428726.66	1955228.344	0.131906632

Table 8: Predicted Y Values and Residual Values for Variable X

4.8.6. Report on P-Value and Confidence Interval

Table 7 depicts respective p -value of 0.005934 and positive coefficient value of 5.151542721. These values are significant at Alpha level $\alpha = 0.05$. The table further shows a confidence interval of 5.05026512130156 and

5.25282032028844. The Alpha level, a priori, for this study is $\alpha = 0.05$. This implies there is 5 per cent probability that we would be wrong; there is 5 per cent likelihood the population mean would not fall within the interval (Ashley et al.; Bowerman & O'Connell, 1990; Frankfort-Nachmias and Nachmias, 2008). However, we are 95% certain our conclusions would be right. Again, the Microsoft Excel output in Table 6 shows degrees of freedom (between) of 1 ($2 - 1 = 1$); degrees of freedom (within) of 106 ($108 - 2 = 106$); total degrees of freedom (df) of 107 ($108 - 1 = 107$), and F-ratio of 10169.903. These values could be interpreted as:

$F(1, 106) = 10169.903, p < 0.05, \text{two-tailed.}$

4.8.7. Interpretation and Rejection of Null Hypothesis

The foregoing results indicate total learners' population has strong influence on total national population. Therefore, we reject the null hypothesis ($H_0: \mu_1 = \mu_2$) which states total learners' population has no strong effect on total national population, and accept the alternative hypothesis ($H_1: \mu_1 \neq \mu_2$) which states total learners' population has strong effect on total national population.

4.9. Need for Debt Relief for Africa

Most if not all African economies have witnessed massive disruptions in their socio-economic activities following the outbreak of the COVID-19 pandemic. Spread of the pandemic has ravaged most economic activities and landed the continent in one of her worst contractions in recent years. Although statistics released by the African Development Bank showed a positive outlook for the current year, available data from the World Bank and other relevant economic institutions depicted sharp decline in the economic performance of African economies while the continent's total output for 2020 was projected to take a nose-dive. Undoubtedly, COVID-19 has compelled the African continent to battle with many significant macro-economic indicators, including inflation and exchange volatilities. These debilitating factors have the tendency to affect Africa's overall economic performance and output; and her contribution to sustainable development of the global economy.

Available data on real gross domestic product (GDP) growth in Africa from 2014 through 2019 depicted fluctuating economic performance. Africa's real GDP growth rate in 2014 was 5.13%. However, this thumped to 3.19% and 1.43% in 2015 and 2016; and increased to 3.0% in 2017 respectively. Africa's respective real GDP growth rates in 2018 and 2019 were 3.27% and 3.07% (Plecher, 2020). The World Bank (2020b) noted the African economy is characterised by 1.334-billion-person market and a citadel of the largest free trade area across the globe. In spite of the foregoing strong attributes, Africa's overall economic performance and contribution to global GDP in recent years have not been encouraging relative to other regions across the globe. For instance, global GDP in 2017 was estimated at US\$80.94 trillion. However, Africa's total contribution was estimated at US\$1.67 trillion, making Africa the least contributor (among six regions) to global GDP during the period. The respective global GDP values in prior years, that is, 2014 through 2016 were US\$73.73 trillion, US\$75.83 trillion, and US\$77.80 trillion. Nonetheless, Africa's respective total contributions during the period were US\$1.83 trillion, US\$1.67 trillion, and US\$1.55 trillion. In percentage terms, Africa's respective contributions to global GDP during the period were 2.48%, 2.20%, and 1.99%. In 2019, global GDP was estimated at US\$87.27 trillion while Africa's total GDP was about US\$2.58 trillion, implying about 2.9% contribution by the latter to global GDP during the period.

The ravaging impacts of COVID-19 on socio-economic activities have had telling effects on inflationary trend in Africa. Data released by Focus Economics (2020) indicated the average rate of inflation in Africa in April 2020 was 15.0%. The rate edged up to 15.2% in May 2020. Rising food prices in Ghana, Angola and Nigeria were identified as the major drivers of inflation while constant price acceleration was apparent in Zimbabwe. Prices kept soaring in triple digits in Zimbabwe during the period. Countries such as Ghana and Nigeria have lowered benchmark rates for banks to increase liquidity and ease loan creation in their respective economies. Some market analysts argued this development had the potential to fuel-up inflation. Nonetheless, managers of the respective Ghanaian and Nigerian economies believe strategic measures put in place were adequate enough to tame the 'muscles' of inflation during the second half of the current financial year. Disruptions in supply and weaker currencies occasioned by COVID-19 were likely to accelerate inflation in the current year above rates recorded in 2019. The average inflation rate in Africa in 2020 was targeted at 9.32%. This was 0.94% higher than the 8.38% recorded in 2019 and 1.72% more than the average rate targeted for 2021. The lower targeted inflation rate (7.6%) was indicative of strong confidence in the African economy to bounce back in 2021.

One of the staggering social issues saddled with African economies is the challenge associated with the reading capabilities of many learners. Available records indicate over 50% of all learners who are aged 10 in developing economies including Africa could barely read (Floyd, 2019). The existence of many local languages and dialects makes the adaption and perfection of national languages such as English, French and Portuguese, among others, quite herculean to many African learners at the basic level. Further, limited socio-economic reforms, uncertainties in global trade, and natural occurrences or disasters have been identified as major contributors to the underperformance of African economies. In 1996, the World Bank and International Monetary Fund (IMF) launched their maiden Heavily Indebted Poor Countries' (HIPC) initiative. This initiative was a comprehensive financial effort aimed at eliminating unsustainable debts in heavily indebted and poorest economies across the globe. However, twenty-four (24) years after the launch of the HIPC initiative, total public debts in developing economies have risen to levels similar to and in some cases more than those in the late 1970s and 1980s.

The foregoing notwithstanding, the composition of public debts in developing economies in recent years is complex; external debts are contracted from traditional development partners such as the World Bank, IMF and International Finance Corporation (IFC); and non-traditional development partners including China, other bilateral and

multilateral financial institutions; and from the global bond markets, among other significant sources. About 24% of Africa's total external debt is owed to China; and Africa's external interest payment commitments to China is between 17% and 20% while 55% of Africa's external interest payments are made to private investors. About 62% of bilateral interest payments in Africa are made to China (Jubilee Debt Campaign, 2018; Kuo, 2020; Solomon, 2020). The foregoing affirms limited financial transactions between the traditional development partners and African economies; and extended bilateral relations between China and Africa in recent years. Some analysts have however argued that financial transactions between developing economies and non-traditional development partners are less transparent.

Generally, the performance of most currencies in Africa against major foreign currencies such as the American dollar, European Union's euro, and the British pound sterling in the current financial year could be described as volatile and fluctuating (Focus Economics, 2020). Available data on the performance of currencies of selected African economies against the American dollar over a six-month period, that is, January through June 2020 revealed the respective Zambian kwacha fell in value or depreciated by 28.2%; South African rand by 21.4%; Mauritian rupee by 9.3%; and the Ghanaian cedi by 2.36%. The rate of depreciation of African currencies relative to major foreign currencies in 2020 was projected to be higher than in 2019.

The Compact with Africa (CWA) initiative was mooted and established by the G-20 member countries under the German Presidency. The primary objective for the formation of the CWA is to enhance investment opportunities in Africa to accelerate development and growth. The CWA currently comprises twelve African countries with the sole aim of addressing major policy issues related to financial, business, and macro-economic frameworks. Statistics indicate foreign direct investments (FDIs) to CWA member-countries in 2018 amounted to US\$21 billion, equivalent to 46% of total foreign direct investments to Africa. During the same period, FDI accumulation in CWA member-countries increased to US\$295 billion, representing about 34% acceleration since 2014 (Floyd, 2019). This affirmed rapid FDI stock accumulation and economic growth in CWA member-countries in recent years.

In order to assume her enviable role in the comity of regional economies across the globe, the African economy is expected to make significant progress in socio-economic reforms, ensure rapid digitisation; and to facilitate implementation of the African Continental Free Trade Area (AfCFTA) agreement, which some analysts have aptly described as a 'once-in-a-lifetime opportunity for [economies in Africa] to work together, create markets, boost exports, and increase cross-border infrastructure' (Floyd, 2019, para. 4). The convention among most African economies that the private sector is the 'engine for growth' calls for the institution and implementation of policies that are business and investment friendly to increase FDI inflows while encouraging strong local participation. To ensure steady economic turnaround in post-COVID-19 era, African leaders are expected to move beyond theoretical economic rhetoric to practical implementation of recommended measures to assure positive improvements in their collective socio-economic performance to enhance the continent's overall contribution to sustainable economic development and growth at the global level.

Some economic pundits have identified a number of factors that could possibly contract the African economy in 2020. Notable among these include sharp fall in prices for commodities such as metals, crude oil, minerals, and other essential global commodities; deteriorating demand from major trading partners; radical measures adapted by countries to contain COVID-19 locally; limited fiscal space and increasing public debts. The foregoing factors are expected to bleak the African economy and drab the outlook further. This notwithstanding, the unfavourable outlook predicted for the African economy in the current financial year is believed to be transient; some economic analysts are of the firm conviction Africa could emerge from the 'ashes' of COVID-19 stronger and more competitive in 2021 and beyond (Ashley, 2020b).

However, Africa's ability to remain competitive in subsequent years is predicated on several factors, including internal and external assistance that could ensure economic resilience to insure the path of strong economic recovery. External assistance required by Africa during these trying socio-economic moments is essentially debt relief; the continent needs debt cancellations to minimise the significant economic losses from the COVID-19 outbreak; and to assure rapid economic recovery to reduce over dependence on advanced economies for socio-economic survival. Africa's total debt commitment in 2020 was estimated at US\$44 billion. Pilling (2020) described the quantum of Africa's total debt commitment in the current financial year as trivial and rounding error relative to financial bailouts granted to western countries in recent years. He argued Africa's win in the fight against COVID-19 is a win to the global community. To wit, the time to provide massive and unreserved debt cancellations; provide the requisite financial and other logistics to ensure Africa weans herself off the ravages of COVID-19; and for Africa to usher herself on the path of sustainable economic recovery is now. Assistance from the developed- to African economies should be geared toward transforming the latter from the socio-economic state of panhandling to the state of economic self-dependence. Stated differently, any external assistance to African economies should aim at liberating them from the shackles of financial challenges and over-dependence, so the continent could assume her enviable role among the comity of regions in the global economy. However, to assure realisation of the foregoing objective, unilateral and multilateral donors could insist strongly on effective utilisation of funds and other logistics provided to African countries through their respective leaders, for the socio-economic purposes intended.

5. Recommendations

The magnitude and propensity of the COVID-19 outbreak on effective planning and co-ordination of academic programmes and activities in countries and territories across the globe were underestimated at the initial stages by many leaders, nationals, and non-nationals. Today, its portentous effect on successful organisation of educational programmes during the current academic year is a clear manifestation to all and sundry. Arguably, COVID-19 is on the verge of emerging as the most shattering pandemic in human history, especially in the areas of speed rate of infection or

transmission and case fatality rate. The disruptive effect of the pandemic on educational programmes and activities at various levels across the globe cannot be over emphasised.

The estimated total learners' population (1.63 billion) affected by COVID-19 calls for adaption and implementation of immediate, medium- and long-term measures at the national, sub-regional, regional, and global levels to prevent similar occurrence in future. Where the occurrence is inevitable, the identified measures should assure minimal effect of the pandemic on global societies; and intended academic programmes and activities. Holistic approach to fighting one of the globe's nemesis, pandemics, is crucial at this juncture. The concerted efforts would be useful to providing the needed antidote to the carnage inflicted on global countries and territories; and an antidote to major disruptions to annual academic programmes and activities by pandemics such as COVID-19. In view of the foregoing, the following recommendations are proffered:

- Sustained educational programmes and activities throughout a given academic year are contingent on various leaders' ability to control internal and external factors such as pandemic outbreaks that have the potential to wreak havoc and cause disruptions. Extant research (Hine, 2010; Samanlioglu and Bilge, 2016; Saunders-Hastings and Krewski, 2016) has proven non-occurrence of similar or higher magnitude pandemic in the near and distant future cannot be guaranteed. However, what could be guaranteed is the ability of leaders of various countries and territories to put the necessary contingency measures and structures in place to avert general disruptive effects on global education, should any pandemic occur. The extent of disruption caused by COVID-19; and the remedial measures identified as useful to sustaining academic programmes should be maintained and improved on by all countries and territories across the globe. Indeed, COVID-19 created the enabling environment for global leaders to condition themselves fundamentally against any possible future outbreak; and the likely disruptive effects on global academic programmes and activities. The time for global leaders to act on responsive and preventive measures is now.
- Throughout history, the World Health Organisation has remained the 'global health watch dog;' and expected to live by this accolade through practical implementation of healthcare delivery guidelines and tips in various member countries and territories. As part of its responsibilities to the global community WHO is expected to provide early signals to enhance preparedness and responsiveness of countries and territories to epidemic and pandemic outbreaks. Identification and institution of proactive measures in various countries and territories through the tutelage of WHO would be useful to minimising the overall number of reported cases and deaths during epidemic and pandemic outbreaks. Towards the peak of the COVID-19 outbreak, health ministries and health professionals in many countries and territories found information shared by the World Health Organisation through its website very useful to their respective causes of containing and preventing further spread. To this end, it is imperative for the World Health Organisation to constantly engage with global leaders directly or indirectly through their respective health ministers on the urgent need for them to consider and prioritise massive investments in health and medical facilities in their respective economies. Such huge investments would minimise global challenges and assure uninterrupted academic programmes and activities during future outbreaks.
- Further, the World Health Organisation must improve on its existing medical facilities to enhance professional service delivery to avoid criticisms from some member countries and territories in the near- and distant future. However, realisation of the foregoing is predicated on myriad of factors including member countries' ability to provide the necessary financial, technological and logistics assistance to the global health governing body. Therefore, we passionately call on member countries to redeem their respective pledges and contributions to the World Health Organisation, so it could improve on overall health service delivery to the global community.
- Over-crowding or large gatherings in public or private places has been identified as a major risk factor to epidemic and pandemic outbreaks; large gatherings escalate outbreaks, and increase the speed of spread. Avoidance of such gatherings through social and physical distancing minimises the potential outbreak of epidemics and pandemics (Saunders-Hastings and Krewski, 2016). As a result, institutionalisation of health and safety measures as part of COVID-19 protocols prior to re-opening of schools is vital to the success of preventive and containment interventions; and useful to the collective fight against COVID-19, and other epidemics and pandemics in future.
- Results from the regression analysis outputs revealed total learners' population has strong influence on total national population. This implies during epidemic and pandemic outbreaks, decisions on school closures in countries and territories with less developed medical infrastructure must be taken quickly to avert uncontrollable spread. Generally, early decisions taken in countries and territories with strong medical technology sophistry, and in those without would be extremely helpful to national, sub-regional, regional and global efforts aimed at stemming the tide; and minimising any socio-economic, including educational harm and costs.
- One of the significant lessons gleaned from the COVID-19 outbreak is the inevitable role of the hybrid or blend system in effective educational service delivery in current and future periods. Fortunately, most developed economies including the United States, United Kingdom, Germany, China, among others, have advanced information and technology (IT) structures that facilitate online tuition. For instance, in the United States, about 5% of all learners at the tertiary level are enrolled online whereas online learners constitute about 20% of tertiary level learners in the United Kingdom (BBC News, 2020). The hybrid system of learning at the tertiary level in the United States, United Kingdom, and in other advanced economies is well-developed. However, its implementation at the pre-tertiary level in many advanced economies is still fraught with challenges. As noted earlier, COVID-19 affirmed the need for all economies to improve on their respective educational structures to shed-off major

disruptions during future epidemic and pandemic outbreaks. It is hoped the world's advanced economies would channel substantial resources into development of the requisite infrastructure to assure efficient and effective distance and online learning at the pre-tertiary level to minimise the disruptive effects of future pandemic outbreaks on planned academic programmes and activities. The capabilities of these advanced countries to live up to the challenge is unquestionable.

- Although significant strides have been made by the world's advanced economies, development of technological structures to facilitate effective online teaching and learning remains a strong challenge to Africa. Improved technology, especially Internet connectivity and penetration remain a major challenge to the continent. For instance, in 2018, average Internet connectivity in Africa was estimated at 39.6%. This was significantly shy of the global average (62.7%). However, within Africa, significant connectivity lag and disparity were observed during the period; Internet connectivity in Burundi remained at 5.3% while Internet coverage in Kenya was estimated at 89.8%. In 2016, Africa consumed only 1% of all the international Internet bandwidth that was produced globally (Global Business Outlook.Com as cited in Ashley, 2020a). Africa's ability to wean herself off the disruptive effect of epidemics and pandemic outbreaks on education is predicated on strong Internet connectivity; this would secure and facilitate online and distance learning. Thus, Africa's share of total consumption of international Internet bandwidth must increase significantly to reflect the continent's commitment to improving on existing structures to assure efficiency and effectiveness in educational service delivery.
- Steps taken by Cameroon to build nine advanced digital development centres in her tertiary institutions deserve commendation. These digital centres are expected to be equipped with state-of-the-art technologies to facilitate distance education, e-library, e-learning, and e-academic, among other significant technological services (Anonymous, 2020). The challenges posed by the predatory COVID-19 pandemic revealed massive financial investments in Internet infrastructure are inevitable if Africa is bent on catching-up with the pace of accelerated development in distance and online learning and education in the advanced economies. Africa's example applies to other global regions with similar challenges.
- Another important resource necessary to engineer successful hybrid system of teaching and learning is stable power supply. Inadequate electricity supply has been identified as a major threat to the survival of academic institutions and other businesses on the African continent. Massive investments in electricity generation capacity and transmission infrastructure remain economically parsimonious in many African countries. Over the past few years, erratic power supply has affected the activities of educational institutions in Ghana and Nigeria in particular, and in many other parts of Africa in general. In 2015 alone, about 13,000 organisations in Ghana were negatively affected by erratic power supply. These organisational casualties included employee lay-offs and liquidation by some small- and medium-scale businesses. Private and public tertiary institutions which decided to continue with teaching and learning uninterrupted were compelled to do so at additional costs. In Nigeria, an average of about 26 power outages is recorded in a month characterised by severe power challenges. Small- and medium-size businesses which decide to continue with production and service provision are compelled to do so at additional costs to manufacturing and service delivery. The affected academic institutions and organisations in Ghana and Nigeria were compelled to purchase alternative power in the forms of generation plants and fuel at higher costs. Generally, frequent power outages during the day and night affect academic institutions' ability to assure effective onsite, online and distance learning as experienced by both public and private tertiary institutions in Ghana between 2015 and 2016. Evidently, power or electricity generation remains a major challenge to Africa. Available statistics revealed over 600 million people in Africa lack access to electricity; and in areas where connectivity is prevalent, supply tends to be erratic. Africa's total population is estimated at 1.34 billion people. This is about 10.6 times the estimated population for Japan (126.5 million people) (Worldometer, 2020a&d). However, Africa's total electricity generation capacity is less than half the power generation capacity of Japan. To reverse the trend and ensure uninterrupted academic service delivery during future epidemic and pandemic outbreaks which may necessitate social and physical distancing, and warrant online teaching and learning, massive investments in electricity generation capacity and transmission infrastructure remain an important economic desideratum to leaders in Africa; and to those in other global regions with similar challenges.
- A sub-regional analysis of the electricity crisis revealed imbalanced supply and access rates in Africa. As at 2018, the average rate of electricity access in North Africa was 97%. This was more than quadruple the average rate of access in East Africa (23%); and more than double the respective average access rates in West Africa (47%) and Southern Africa (43%). Central Africa had an average access rate of 25% during the period. The foregoing implies the average electricity access rate in Africa during the period was 47% $((97\% + 47\% + 43\% + 25\% + 23\%) \div 5 = 235\% \div 5 = 47\%)$. This was less than half the respective access rates in China (100%) and Brazil (97%); and more than half the access rate in India (82%). Although the average access rate in East Africa (23%) during the period under review was low, Kenya had an access rate of 73%, with a target of 95% access rate by 2020. The 73% access rate was a significant jump from an earlier access rate of 25% in 2012. Some analysts opined realisation of the 2020 target (95% access rate) would usher Kenya on the list of global economies with the greatest power success narratives.
- The electricity access rate in Tanzania during the period was estimated at 32% in spite of the numerous resources at her disposal, including sources of non-renewable fuel such as gas; and renewable such as wind, geothermal and hydro. The average electricity access rate in Africa in 2018 (47%) was an improvement over the 40% access and reliable supply rate recorded in 2016. As at 2016, only two African economies could boast of 100% electricity

access rate. These included Egypt and Mauritius. These countries commensurate high access rate with reliable power supply. Conversely, Burundi had low levels of reliable power supply; and this reflected low generation and access rates in the country (Kazeem as cited in Ashley, 2020a). The preceding explanation re-emphasises the need for African leaders and those in other global regions to make massive investments in electricity infrastructure a priority to help address current pressing and future educational challenges.

- Available statistics from the World Bank (as cited in ESI-Africa, 2015) noted the electrification access rate in Ghana as at 2012 was 64.1%. This was 21.3% short of the access rate in South Africa (85.4%) during the period. However, due to increased investment in electricity generation capacity and transmission infrastructure, the access rate in Ghana in 2015 was estimated at over 80%, one of the highest power penetration rates, together with South Africa on the continent. The foregoing notwithstanding, the immediate socio-economic benefits of the massive investment in power generation was not felt in the Ghanaian economy during the period; the years 2014 through 2016 were characterised by frequent power outages and power rationing in many parts of the country, which culminated in the use of the local terminology, *Dumsor*. In 2015, the then Ghana's Energy Minister, Dr. Kwabena Donkor, assured the nation and the whole world of the country's preparedness to end power rationing by 2016. His assurance was based on massive investment in energy infrastructure, including the purchase of power barges. Currently, Ghana has a total installed electricity generation capacity of about 4,700 megawatts, implying she generates about 2,000 megawatts in excess of her total peak consumption capacity of 2,700 megawatts. The data revealed Ghana's electricity access rate increased by about 15% between 2012 and 2015 (ESI-Africa, 2015). Ghana's target is to ensure universal access to electricity supply by 2020 (USAID, 2020a). The access rate in Nigeria in 2015 was 60% (World Bank as cited in Sustainable Energy for All, 2020b). Through the implementation of the Sustainable Energy for All Country Action together with other action plans, Nigeria emerged with the following targets: increase electricity access rate to 75% by 2020; and increase access rate to 90% by 2030 (Sustainable Energy for All, 2020b). In many countries throughout Africa and across the globe, onsite classes at the tertiary level are organised during the day and in the evening. This makes stable power supply essential to the success of both onsite and online teaching and learning programmes. Thus, efforts of countries in Africa and in other global regions toward ensuring stable power generation and supply to facilitate teaching and learning, both onsite and online, deserve commendation. These efforts are worthy of emulation by countries and territories that are deficient and saddled with tremendous challenges in energy and infrastructure development.
- In some cases, the installed generation capacity of electricity in African countries is at variance with the actual electricity generation capacity available for distribution and consumption. For instance, Kazeem (2016) estimated electricity access rate in Nigeria at 90% and connectivity rate at 96%. In spite of the high access and connectivity rates, reliable power supply in Nigeria during the period stood at only 18%. Some identified factors responsible for this variance included outmoded or worn-out infrastructure, inadequate supply of fuel, and changes in hydrological conditions, among others (USAID, 2020b). These constraints obviously affect the rate of access to electricity supplies in many parts of Africa; they affect stable power generation and adequate supply to academic institutions. This in turn affects the institutions' ability to ensure efficiency and effectiveness in onsite, distance and online teaching and learning services. The foregoing challenges affirm the need for immediate-, medium-, and long-term measures to address the perennial energy crises in Africa; and in other parts of the world.
- Explanations in the preceding paragraphs suggest adequate power generation, reliable power supply, and strong Internet connectivity are precepts for global countries and territories to ensure equal access by both privileged and under-privileged learners to technological learning platforms; bridge the existing gap between learners in urban and rural areas; bridge the gap between privileged and under-privileged learners; and to secure teaching and learning environments against future epidemics and pandemics.
- Contribution of the digital economy to the respective gross domestic products of some African countries in recent years was estimated to be in excess of 5%. It is firmly believed the contribution could inch to 12% or more if countries on the continent are able to scale-up their investments in digital technologies. Increased investments in digital technology could churn out significant educational and general economic outcomes and benefits; it would increase learners' access and participation in distance and online learning; ensure increase in enrolment and expansion of academic institutions; create job opportunities for instructors, IT experts and academic staff; orient the implied economies towards the digital revolution; and increase regional and global competitiveness. Further, implied countries could witness remarkable economic expansion; and increase economic growth rates beyond annual targets. Given its enormous socio-economic benefits, digital technology is strongly recommended to all countries and territories across the globe (Ashley, 2020a).
- Weaknesses in existing global surveillance systems were exposed by the COVID-19 outbreak. The narratives revealed early response, prevention, and treatments are contingent on early signals from epidemic and pandemic outbreaks. Although the World Health Organisation has an arduous task of constant surveillance and prompting countries and territories of impending epidemic and pandemic outbreaks, individual countries and territories could complement the efforts of WHO by acquiring and installing state-of-the-art technological equipment and medical facilities in their respective health or designated centres. This would facilitate early detection, prevent further spread of epidemics; and curb the transformation of epidemics into pandemics. Leaders of global countries and territories are entreated to take directives related to epidemic and pandemic outbreaks from the

World Health Organisation seriously to minimise the devastating effects of same, in terms of total reported cases and deaths on respective countries and territories; and on the global community.

- The sporadic outbreak and menacing effects of COVID-19 affirmed the need for strict implementation of the International Health Regulations (IHRs) in various countries and territories. The content of IHRs presents comprehensive guidelines that could ensure tremendous improvements in public health structures and capacities; and facilitate preparedness and responsiveness to emergency health situations as occasioned by epidemic and pandemic outbreaks. Indubitably, the quest to develop global countries and territories' public health structures in compliance with IHRs specifications is analogous with ensuring efficiency and effectiveness; and ensuring structure-development capacities based on international standards. Strict adherence to IHRs standards facilitates the insurance of medical facilities established in countries and territories against overcrowding during epidemic and pandemic outbreaks.
- Indeed, academic programmes and activities at various levels (pre-primary through secondary levels, and tertiary level) in thousands of public and private educational institutions were severely affected by the COVID-19 outbreak. Available statistics indicated over 1.63 billion learners were impelled to interact with their respective instructors through virtual classroom settings. The simmering challenges posed by COVID-19 compelled some educationists, analysts, and social commentators to conclude COVID-19 was a major setback to global education. Although the foregoing argument holds, it is imperative to note COVID-19 created a unique opportunity for stakeholders in academia to enhance global innovativeness in teaching and learning.
- Further, COVID-19 compelled instructors who hitherto were only accustomed to the traditional method of teaching and learning that is, the 'brick and mortar' or physical classroom settings, to be abreast of modern teaching methods and practices, including strong knowledge in the use of computers and other teaching or instructional technologies. Gone are the days when the physical classroom settings were seen as the only 'safe haven' for efficient and effective impart of academic and social knowledge to learners at various levels. Undeniably, COVID-19 served as a defining moment; it reminded 'classical' instructors of social and technological evolution; and the urgent need for them to quickly evolve to adapt same, so they are not left behind in the dynamic and ever-changing global teaching and learning environment.

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Appendix

Country	Pre-Primary To Secondary	Tertiary Level	Total Learning Population
Afghanistan	9,608,795	841,365,735	9,979,405
Albania	520,759	131,833	652,592
Algeria	9,492,542	743,640	10,236,182
Argentina	11,061,186	3,140,963	14,202,149
Armenia	437,612	102,891	540,503
Austria	1,278,170	430,370	1,708,540
Azerbaijan	1,783,390	200,609	1,983,999
Bahrain	247,489	44,940	292,429
Bangladesh	36,786,304	3,150,539	39,936,843
Belgium	2,457,738	526,720	2,984,458
Bolivia*	2,612,837		2,612,837
Bosnia and Herzegovina	428,099	95,142	523,241
Bulgaria	974,469	249,937	1,224,406
Burkina Faso	4,568,998	117,725	4,686,723
Cambodia	3,310,778	211,484	3,522,262
Cayman Islands*	9,182		9,182
Chile	3,652,100	1,238,992	4,891,092
China**	233,169,621	42,266,464	275,436,085
Colombia	9,124,862	2,408,041	11,532,903
Costa Rica	1,100,782	216,700	1,317,482
Côte d'Ivoire	6,120,918	217,914	6,338,832
Croatia	621,991	165,197	787,188
Cyprus	135,354	45,263	180,617
Czech Republic	1,715,890	352,873	2,068,763
D. P. Republic of Korea	4,229,170	526,400	4,755,570
Denmark	1,185,564	312,379	1,497,943
Ecuador	4,462,460	320,765	4,783,225
Egypt	23,157,420	2,914,473	26,071,893
El Salvador	1,414,326	190,519	1,604,845
Equatorial Guinea*	160,019		160,019
Estonia	224,987	47,794	272,781
Ethiopia	23,929,322	757,175	24,686,497
Fiji	421,329	32,565	453,894
France	12,929,509	2,532,831	15,462,340
Gabon	468,362	10,076	478,438
Georgia	732,451	151,226	883,677
Germany	12,291,001	3,091,694	15,382,695
Ghana	9,253,063	443,693	9,696,756
Greece	1,469,505	735,027	2,204,532
Grenada	26,028	9,260	35,288
Guatemala	4,192,944	366,674	4,559,618
Honduras	2,018,314	266,908	2,285,249
Hungary	1,504,740	287,018	1,791,758
Iceland	80,257	17,967	98,224
Indonesia	60,228,569	8,037,218	68,265,787
Iran	14,561,998	4,073,827	18,635,825
Iraq	7,010,788	424,908	7,435,696
Ireland	1,064,091	255,031	1,319,122
Israel	2,271,426	210,041	2,481,467
Italy	9,039,741	1,837,051	10,876,792
Jamaica	552,619	74,537	627,156
Japan*	16,496,928		16,496,928
Jordan	2,051,840	320,896	2,372,736
Kenya	13,751,830	562,521	14,314,351
Kuwait	632,988	116,336	749,324
Kyrgyzstan	1,443,925	217,693	1,661,618
Latvia	313,868	82,914	396,782

Country	Pre-Primary To Secondary	Tertiary Level	Total Learning Population
Lesotho	313,868	82,914	396,782
Libya	1,510,198	375,028	1,885,226
Lithuania	460,257	125,863	586,120
Luxembourg	102,839	7,058	109,897
Malaysia	6,677,157	1,284,876	7,962,033
Mauritania	928,218	19,371	947,589
Mexico	33,159,363	4,430,248	37,589,611
Mongolia	870,962	155,248	1,026,210
Montenegro	111,863	23,826	135,689
Morocco	7,886,899	1,056,257	8,943,156
Namibia	689,520	56,046	745,566
Netherlands	3,336,544	875,455	4,211,999
North Macedonia	298,135	61,488	359,623
Norway	1,073,521	284,042	1,357,563
Pakistan	44,925,306	1,878,101	46,803,407
Palestine	1,404,021	222,336	1,626,357
Panama	837,246	161,102	998,348
Paraguay	1,519,678	225,211	1,744,889
Peru	8,015,606	1,895,907	9,911,513
Poland	6,003,285	1,550,203	7,553,488
Portugal	2,028,254	346,963	2,375,217
Qatar	309,856	33,668	343,524
Republic of Korea	7,044,963	3,136,395	10,181,358
Republic of Moldova	498,881	87,277	586,158
Romania*	2,951,879		2,951,879
Rwanda	3,388,696	75,713	3,464,409
Saint Lucia	30,925	2,237	33,162
Saudi Arabia	6,789,773	1,620,491	8,410,264
Senegal	3,475,647	184,879	3,660,526
Serbia	964,796	256,172	1,220,968
Slovakia	832,055	156,048	988,103
Slovenia	332,677	79,547	412,224
South Africa	13,496,529	1,116,017	14,612,546
Spain	7,696,101	2,010,183	9,706,284
Sri Lanka	4,917,578	300,794	5,218,372
Sudan	8,171,079	653,088	8,824,167
Switzerland	1,289,219	300,618	1,589,837
Syrian Arab Republic	3,491,113	697,415	4,188,528
Thailand	12,990,728	2,410,713	15,401,441
Trinidad and Tobago	260,439	16,751	277,190
Tunisia	2,479,163	272,261	2,751,424
Turkey	17,702,938	7,198,987	24,901,925
Ukraine	5,170,368	1,614,636	6,785,004
United Arab Emirates	1,170,565	191,794	1,362,359
United States***			55,100,000
Uzbekistan	7,174,483	299,634	7,474,117
Venezuela*	6,866,822		6,866,822
Yemen	5,852,325	267,498	6,119,823
Zambia	3,955,937	56,680	4,012,617

Table 9: Learning Population Distributions for Selected Global Economies

Source: UNESCO

*Data Exclude Tertiary Level Learners

**Data Include Hong Kong and Macao

***Data Exclude Breakdowns

Percentile	Y
0.462962963	65722
1.388888889	112523
2.314814815	183627
3.240740741	341243
4.166666667	625978
5.092592593	628066
6.018518519	896445
6.944444444	1207359
7.87037037	1326535
8.796296296	1399488
9.722222222	1402985
10.64814815	1701575
11.57407407	1886198
12.5	2078938
13.42592593	2083374
14.35185185	2142249
15.27777778	2225734
16.2037037	2540905
17.12962963	2722289
18.05555556	2877797
18.98148148	2881053
19.90740741	2961167
20.83333333	2963243
21.75925926	3278290
22.68518519	3280819
23.61111111	3989167
24.53703704	4033963
25.46296296	4105267
26.38888889	4270571
27.31481481	4314767
28.24074074	4649658
29.16666667	4937786
30.09259259	5094118
31.01851852	5101414
31.94444444	5421241
32.87037037	5459642
33.7962963	5792202
34.72222222	6486205
35.64814815	6524195
36.57407407	6825445
37.5	6871292
38.42592593	6948445
39.35185185	7132538
40.27777778	8654622
41.2037037	8655535
42.12962963	8737371
43.05555556	9006398
43.98148148	9660351
44.90740741	9890402
45.83333333	9904607
46.75925926	10139177
47.68518519	10196709
48.61111111	10203134
49.53703704	10423054
50.46296296	10708981
51.38888889	11589623
52.31481481	11673021
53.24074074	11818619
54.16666667	12952218
55.09259259	16718965

Percentile	Y
56.01851852	16743927
56.94444444	17134872
57.87037037	17500658
58.7962963	17643054
59.72222222	17915568
60.64814815	18383955
61.57407407	18776707
62.5	19116201
63.42592593	19237691
64.35185185	20903273
65.27777778	21413249
66.2037037	25778816
67.12962963	26378274
68.05555556	28435940
68.98148148	29825964
69.90740741	31072940
70.83333333	32365999
71.75925926	32971854
72.68518519	33469203
73.61111111	34813871
74.53703704	36910560
75.46296296	37846611
76.38888889	38928346
77.31481481	40222493
78.24074074	43733762
79.16666667	43849260
80.09259259	43851044
81.01851852	45195774
81.94444444	46754778
82.87037037	50882891
83.7962963	51269185
84.72222222	53771296
85.64814815	59308690
86.57407407	60461826
87.5	65273511
88.42592593	69799978
89.35185185	83783942
90.27777778	83992949
91.2037037	84339067
92.12962963	102334404
93.05555556	114963588
93.98148148	126476461
94.90740741	128932753
95.83333333	164689383
96.75925926	220892340
97.68518519	273523615
98.61111111	331002651
99.53703704	1447470092

Table 10: Probability Output