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Covid-19 Pandemic and Disparity in Household Adaptations to School Lockdown: Redressing the Myth of Educational Equality

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Abstract

This study investigated two variables: household inequality and adaptation to school closure during the COVID-19 school lockdown in one city in a middle-income country in Sub-Sahara Africa. The findings suggest high social and economic cost due to the digital gap particularly for less endowed households, strengthening the view that contemporary increased technology-based curricula do favour those on the positive side of the digital gap, which prevented already vulnerable children from indigent households to access remote online learning during the school lockdown. This exacerbated the already widening gap between children from high socioeconomic background and those not so endowed. The COVID-19 pandemic rehashed the myth of educational equality. Contemporary focus on technology-based curricula calls for the need to redress the embedded inequality in access and use of technology. Insights from this study suggest that persistent disparity in technology access and use as underscored by the pandemic, may have to be given the needed attention in order not to thwart otherwise good benefits of increased educational access in many countries in the developing economies.

Keywords: COVID-19, school closure, household adaptations, digital inequality

1. Introduction

Technology access is considered essential to success in contemporary education and human resource development (Moore & Vitale, 2018). This notwithstanding, there is persistent disparities in access to technology based on differences in geography, income status, race and ethnicity (Federal Reserve Bank 2016). The disparity between people with enhanced knowledge of, as well as of access to contemporary technology relative to those who do not, is seen not only to perpetuate, but also to deteriorate both the social and economic status and other already existing inequalities for indigent groups (Moore & Vitale, 2018). The digital divide has also been referred to as 'home work gap' as a result of challenges faced by technology-deficient students when they have to do work at home online. This technological gap continues to become more widened because of instructors and teachers increasing incorporation of internet-based learning into the curricula (McLaughin, 2016) and especially during the COVID-19 pandemic. This perceived imbalance between peoples, households, as well as geopolitical units regarding technology access and information usage, and communication in general, continue to be topical debates (Pick & Sakar, 2016). Therefore, taking a deeper investigation into students with lack of access to technology or with access to single technological device becomes critical due to the frustrations that confront these types of learners' which those with access do not face (Moore & Vitale, 2018).

The experience of the COVID-19 global pandemic with its consequent school closure as part of measures to control the spread of the transmission and the move to remote learning through technology (UNESCO, 2021), brought to the fore the subject of the digital-gap. Indeed, already since the 1990's, the motivation to want to have digital media/internet has increased and continues to grow with its antecedent physical gaps in having digital media (http://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2020/08/The-Digital Divide-and-the-Covid-19-Pandemic-1.pdf). These physical gaps are related to income, occupation and countries of regions, raising concerns about inequality (UNESCO, 2020b; European Commission 2020; van de Werforst et al. 2020). During the period of the pandemic lockdown, lack of physical access to technology such as internet connectivity, broadband opportunities, digital mobile devices in general, unequal access to Information Technology (IT) resources, etc. seemed to have heightened the technology gap, especially on people who were economically disadvantaged (Lee, 2018; www.eqoptech.org; Federal Reserve Bank of Dallas, 2016; Moore, Vitale & Stawinoga, 2018; van de Werforst et al. 2020), rehashing the classical philosophical debate of the myth of educational equality (Aristotle, 1959; Block, 1961; Guillory, 1993; Durkheim, 1997 and Lloyd, 1990). A defining characteristic of the school closure was lack of teacher support as opposed to the traditional in-person classroom. In lieu of teacher support was physical access to internet connectivity (Moore, Vitale & Stawinger (2018).

1.1 Statement of Problem

While there is increasing empirical evidence of disparities in remote learning during the school lockdown in many developed economies which had critical implications for learners' outcomes (Donnelly & Patrinos, 2021), similar studies appear not to have been amply investigated in the

case of lower-income countries in sub-Sahara Africa, especially on how households adapted to the pandemic lockdown. This is even more compelling, given the fact that already countries in sub-Sahara Africa are recorded to have a weak learning base (Angrist, Djankov, Goldberg, & Patrinos, 2021) relative to other geopolitical areas, and therefore less likely to experience the benefits and effectiveness of remote learning. Secondly, given the fact that, technology access continues to be critical to both success in education as well as human resource development in contemporary education, it is imperative to investigate whether or not geography, as well as socioeconomic and racial/ethnic inequalities in access to technology persists (Federal Reserve Bank of Dallas, 2016) in sub-Sahara Africa as well. Thirdly, mounting empirical studies have been conducted in jurisdictions with higher internet access (Donnelly & Patrinos, 2021) with few pertaining to countries with high disparity in internet connectivity. It will be important therefore to examine household inequality with focus on technological divide, and how they adapted to the online distant learning, and its role in increasing or decreasing inequalities (Wolf, Aurino, Suntheimer, Avornyo, Tsinigo, Jordan, Samanhyia, Aber, & Behrman, 2021; Moore, Vital & Stawimnger, 2018). For example, Ghana was among the first countries in the West African sub-region to close schools, while ensuring opportunities for continuous online distance learning (cf. Adarkwah, 2021). The initiative of the Government of Ghana is to enhance education at all times and at all places for learners by ensuring effective teaching and learning through ICT (Adarkwah, 2021). With COVID-19, forcing nations to adopt online learning, it would be interesting to investigate, the extent of ICT initiative during the lockdown period whether or not disparity in digital access and use widened the already existing learning gap between children from affluent and less affluent households' as they followed remote online learning. These have not been fully investigated in this study area, hence the need to fill this gap in the literature.

1.2 General Research Objective

This paper investigated the relationship between household inequality and adaptation to the COVID-19 school lockdown.

1.3 Specific Research Questions

The following specific questions guided this study:

1) How did household inequality in technology and other resources influence online remote learning at the time of the COVID-19 school closure?

2) How did technology access and use in households manifested differences in children's response to remote online learning?

3) How do we develop national plans to identify existing inequalities in technology use and access?

4) How do we ensure additional spending to redress the digital divide between disadvantaged and endowed children?

1.4 Significance of the Study

It is expected that the findings of this paper will constitute an invaluable resource to all stakeholders in education as schools gradually move from the traditional student-teacher face-to-face to combination of remote and in-person leanring. This is especially so, as most developing economies, continue to spend huge part of their budget on education. Currently, it is estimated that governments in African use roughly 5 percent of their GDP on education alone, which appears to be the second highest globally (https://www.brookings.edu/blog/africa-in-focus/2020/02/13/figures-of-the-week-public-spending-on-education-in-africa).However, educational access in most developing economies (especially now with focus also on remote leanring) does not necessarily mean that all children start education on a level plain field. The findings from this study will therefore benefit all stakeholders, especially teachers and policy makers that some children start schooling already disadvantaged (cf. http://www.brookings.edu; https://www.oecd.org › education › school).

2. Theoretical Framework/ Review of Literature

Research on the digital divide for the last five or so years has been underscored by theoretical framework that accounts for the disparity and unevenness between and among individuals, households (Pick & Sarkar, 2016) as well as that of geopolitical units regarding accessibility to and usage of information and technologies of communications (van de Werforst et al., 2020) In this section under the theoretical framework, four theories of theoretical divide will be discussed and how these theories are inextricably linked to inequality embedded in social systems. The following theories of the digital divide are examined: *a) Adoption diffusion theory; b) Van Dijk's model of Digital Technology Access; c) the Unified theory of Acceptance and Use of Technology and d) Spatially Aware Technology Utilization Model (SATUM)* in addition to other sociological literature on inequality.

2.1 Adoption Diffusion Theory of Digital Divide (ADT)

This theory in terms of origin was the outcome from studies regarding both the adoption and diffusion of different innovations in the 1950's and early 1960's. One researcher by name Everet Rogers was the one who consolidated the varied and different knowledge of the innovations to constitute an extended theory of adoption and diffusion and innovations (Rogers, 1962). Even though, ADT was not originally developed with digital divide in mind, yet it was offered as a conceptual framework with application across variety of fields, which included spread of electronic games, drug prescription, personal computers and cellphones, etc. This broad-based approach has implications for the digital divide theory. The first advantage is that this theory presents increased robustness for different mixture of technologies. Its disadvantage as a theory appears to be that some refinements may be missing with respect to the factors and process steps customized for Information and Communication Technology (Pick & Sarkar, 2016). Adoption Diffusion Theory refers to the process of adopting innovation for use, as well marketing its usage among possible future users (Pick & Sarkar, 2016). Consequently, for digital divide theory, ADT is seen to apply to instances of where there is an on-going spread

of ICT as time goes on. One other critical element of ADT is any novelty of ICT is theorized to be made known and unfolded by means of communications channels to new future adopters. The theoretical implication here is that models built on ADT must have to account for pathways of transmission about the novelty. Additionally, ADT is conceptually perceived as occurring in a social network by which the system needs to be understood to be able to apply the theory. ICT is not only new, but it is also a service which is dependent on a given social environmental system. For example, whereas in the Silicon Valley, a 3-D cellphone is no longer a novelty, in Sub-Sahara Africa it is utilized by section of the population. Thus, Technologies continue to advance almost every minute (Pick. & Nishida, 2015) and hence ADT investigators need to ensure that this advancement in any given society is factored into the discussion.

2.2 Van Dijk's Theory of Digital Technology Access

Jan A.G.M. van Dijk's theory took some ten years to be developed culminating in a book form (van Dijk, 2005). The theory posits that personal and background inequalities are the predicting factors for inequalities in resources for the individual. These precipitates disparity of access and finally the inequalities of individual participation. Participation also implicates positional characteristics which in turn forms a feedback loop (Pick, & Sarkar, 2016). The basic point in this theory is that inequalities are perpetuated with respect to the access and use of technologies in society (Pick, & Sarkar, 2016; van Dijk, 2005). It is the individual's positional characteristics that are seen to influence technology access and use (Pick. &. Nishida, 2015). Some of the personal characteristics include age, gender, intelligence, health, etc. For example, the available mental (knowledge) resources become different for varied users. In the thinking of Van Dijk, inequalities both in terms personal, as well as positional characteristics, have implications for resources a person has. It is also for this reason that resources in terms of mental, cultural social, time and material are also distributed unevenly. In the theory, steps involved are conceptualized to be a circular process involving the following: motivation for access, access involving both hardware and software, sharpening skills in ICT, as well as gaining usage access. This process is an overtime recurrence and, in many instances, occur through steps that are iterative (van Dijk 2009).

2.3 Unified Theory of Acceptance and Use of Technology (UTAUT)

This theory uses some elements from eight information technology research theories to explain the acceptance of technology at the level of the individual (Venkatesh, Morris, Davis & Davis, 2003). UTAUT's uses a dependent variable which is referred to as '*behavioral intention'* (BI) – the extent by which a person decides to use technology. This also depends on the model's key constructs which are expected performance and effort, and also on social influences (Nievhaves &. Plattfaut, 2014; Venkatesh, Morris, Davis & Davis, 2003). Thus, final use of individual behaviour is contingent upon BI and the facilitating conditions. There are some factors such as age, experience and voluntariness and gender, which influence relationship between the key constructs of UTAUT as well as the behavioral intention. In terms of relevance of this theory to the digital divide, most researchers concur that the digital divide may have to be defined in two ways (Yu, 2006): a) *acceptance,* and b) *use.* Thus, this theory appears to offer some explanation for technology acceptance and use while remaining silent on access (NTA,

2011).

2.4 Spatially Aware Technology Utilization Model (SATUM)

This model is predicated on two underlying factors- demographic and socioeconomic which include the following**:** infrastructural factors such as, availability of electricity, structure of market, ICT cost, workforce services, gender, ethnicity and race, education, structure of family, indicators of economic development, for example, the GDP and many ((Yu, 2006). These factors have been submitted and have been tested empirically in the literature in the digital divide. They are seen to be linked to other ICT access indicators and its utilization. Urbanization and its extent are also seen to be included in models that investigate technology adoption, which is reported to have significant relationship with dependent variables in ICT. Prior to this model, the literature on digital divide was found to be mute regarding the presence of spatial autocorrelation in error terms, which means that geographic factors were seen to be exogamous to the conceptual model (Longley et al., 2011). The main theoretical position of this model is the association between demography, socioeconomic and economic development index etc. Additionally, social capital is seen as connected socially to individuals and communities' access to technology and its use.

2.5 Summary

These theoretical models presented on the digital divide have both strengths and weaknesses. The ADT is premised on how features and expansion of innovations over a period have impact on persons or households. The theory of Van Dijk's focuses on the complexity and inequality of social as well as behavioral influences on the individual, and how these precipitate disparity in both technology access and disparity in participation. That of UTAUT goes beyond access to use behaviour, while SATUM is less concerned with innovation features and focuses rather on social, economic, openness of society, infrastructural and social capital, which in combination, enhance more flexibility than other levels of analysis. Additionally, SATUM appears to be more related to environmental factors, which make it more amenable to issues of social and environmental inequality that predict whether or not a household would have access to technology. Using a model of Spatially Aware Technology Utilization Model (SATUM) with focus on demographic and socioeconomic status, such as age, gender, income, education, family structure, etc., this study measured the relationship between household inequality and adaptation to the pandemic school closure, using two measuring scales: Affluence scale and questionnaires to gather data on the research questions from school children, parents and teachers.

3. Method

3.1 Sample

An estimated stratified purposive sampling of three hundred (300) respondents participated in this survey. They comprised fifty households. Each household had five (5) respondents: 3 basic school pupils with their parents (guardians), making a total two hundred and fifty (250). Fifty

basic school teachers were randomly selected to participate, making three hundred (300) respondents. In all, these fifty (50) households were randomly selected from four communities in the Kumasi city. Parents were within the age range of 22 and 45 years, with an average age of 33.70. Out of the one hundred (100) parents, 75% were living as two-parent family, while the remaining 25% were single female parents mostly from the less endowed households. Regarding educational attainments of these parents, 50% were university graduates, while the other 50%, 20 of them had completed Senior and Junior High Schools, and the rest 30 lacked formal schooling. Regarding economic status of these parents, those who lived with partners showed better characteristics relative to those from single-parenting. Parents with higher education were seen to have better remuneration in relation to the less educated and the single mothers. Highly educated parents were earning a combined mean of US$28,000 per annum, the less educated parents earned an average of US$2,400 per annum. One hundred and fifty (150) children participated from the four communities. They ranged from 12-16 years. All were normal children with no physical or learning disability, with average age of 14 years 4 months and of about 2.5 years of enrolment in the Junior High School. Seventy (70) were females, the rest were males. Average Cumulative Grade Point was about 2.9. The fifty (50) teachers, thirty (30) possessed the Diploma in Basic Education (DBA), fifteen (15) the Bachelor of Education in Basic Education (B.Ed. Basic Education) and five (5) had the Bachelor of Education in Secondary Education (B.Ed. Secondary Education). Twenty of the teachers were females, the remaining were males. In terms of age, they were between 25-50 years of age, with an average age of 30.85.

Table 1. Sample Details

Number of Respondents	Age	Education	Gender
Parents: 100	22-45 years	50% graduates; 20% SHS &JHS; 30% no formal education	60 females; 40 males
Students: 150	12-16 years	JHS level	70 females; 30 males
Teachers: 50	25-50 years	30 DBA; 15 B.Ed. basic; 5 B.Ed. Sec	20 females; 30 males
Total: 300			

3.2 Measuring Instruments

Data collection was done through two measuring instruments: a) an adapted version of the *Family Affluence Scale* (FAS) and b) *Questionnair*e. The Family Affluence Scale measures family material wealth indicating absolute level regarding socio-economic position (Boyce et al., 2006; Currie et al., 2008) To ensure a composite scores that ranged from 0 (low affluence) to 9 (high affluence), items were combined. This adapted version consisted of 6-item questionnaire and participants were requested to score each item. For example: 1) Does your family possess a car or another vehicle? (No = 0; Yes, one = 1; Yes, two = 2, Yes, three=3); 2)

Do your children have their own bedrooms? (No = 0; Yes = 1); 3). How many computers (including laptops and tablets, does your family own? (None = 0, One = 1; Two = 2; More than two = 3); 4) Do your children have access to television? (None = 0, One = 1; Two = 2; More than two = 3); 5) Does your family have a library or your children have access to books outside of school; 6) Do you have constant access to internet connectivity in your house? (None = 0, One = 1; Two = 2; More than two = 3)? It must be explained that family material wealth using the Affluence scale was used as an indicator to measure household inequality and by implication whether or not a household had access to technology and its use. This was the independent/predictor variable. The criterion/dependent variable was household adaptation. The higher the score on the predictor variable, the better endowed was the household and therefore more likely for children from that household to have access to both technology and its use and so were better able to adapt more to the new situation of on-line remote learning during the lockdown.

3.2.1 Adaption to School Closure

'Adaption to school closure' as used here in this study was the online remote learning through technology access such as internet, WhatsApp, Zoom, google classroom etc. in lieu of physical teacher support. As used here the phrase 'academic engagement' is synonymous with online remote teaching/learning through zoom, google classroom, television, internet, WhatsApp, Microsoft Teams etc., by teachers to children during the pandemic school closure. Aggregate scores on household affluence were summed up to delineate perceived scores and their correlation to vulnerability to technology access/use or otherwise during the school closure on the selected households. Scores ranged from 0-5 with high scores ranging from 3-5, moderate scores, 1-2 and low scores 0-1. Pre-test reliability of the instrument was found to be .84, .85 and .86 for each of the samples. In addition to the Affluence Scale, another data collection instrument- a self-structured questionnaire (as a back-up) was used. It was to gauge household parents and school teachers' (who were also parents) as well as children's perspectives especially on the relationship between household inequality and adaptation to the closure as measured by digital access and use/ lack of digital access (internet, WhatsApp, Zoom, google classroom etc.).

3.2.2 Responses to Questionnaire

Respondents to this questionnaire were asked to respond to the four (4) research questions that guided this paper especially questions 1 and 2. Detailed specific questions that were asked on the questionnaire under research questions 1 and 2 included: a) percentage of children who reported the number of electronic/technological gadgets available to them at home relative to annual family income (No device; One device, Two Device, Three Device, Four Device, Five Device); b) percentage of students reporting type of internet access (cellular data, broadband, satellite, dialing, prepaid; other) ; c) percentage of students reporting number of devices they have at home by parental educational level (No school; basic level, Senior High; Diploma, Bachelor's, Postgraduate, etc.) The responses to the questionnaire were also coded and analyzed through regression analysis to model differential household responses to family affluence, using SPSS version 20. It is important to explain that the other study variables in the research questions such as Covid-19 school closure and disparity in digital access, the need for

national plans to identify existing inequality in the digital access and use, as well as additional spending to bridge the disparity in technology access and use, were deemed important to be investigated in this study because the underlying hypothesis of this study was that how households adapted to the school closure (that is remote online learning) were all directly related to household affluence or lack of affluence. Which reflected either in a household having access to technology or lack of technology access and use.

4. Results

Household Inequality and adaptation to School Closure (Accessing online remote learning through technology)

Having coded the responses from respondents to this question, simple regression was used to model how household inequality implicated household differential adaptation to the closure. Below is a summary of the regression analysis:

Table 2. Model Summary of Linear Regression Analysis

R	R Square	Adjusted R Square	Std Error
.497	.397	.359	7.606

The 'R' value in the above Table 2 presents the extent of correlation between the predictor variable (that is the independent variable) in this case household inequality to the criterion variable (Dependent variable) adaptation to school closure. As indicated in the Table above, there is a positive correlation of r=0.497 between household inequality predicted by such factors as whether or not a family owns a means of transport, whether or not each child in the family has his/her on bedroom, number of computers including laptops and tablets and whether children had access to television and or there is constant access to internet connectivity in the household, etc. As also shown in Table 2, the 'R' square value determines the coefficient. This is an indicator of the extent of the variability in the predictable t variable (response to school closure) could be explained by the independent variable (household inequality). In other words, how much of the response, namely, adaptation to school closure could be explained in terms of material and financial inequality. The above Table is suggestive that at least 40 percent of the variability in adaptation to school closure. That is that two (2) out of every five (5) households investigated in this study could be explained by the independent variable, that is household inequality. It must be noted as well, that adjusted R square as indicated in the Table is significant in the model, even though the predictor variable was only one, yet it consisted of varied interrelated factors of inequality. In order to get a true indication of the predictive power, the values of the independent variables' coefficient and the estimate of the linear regression is found the Table 3 below:

Table 3. Coefficient of the Linear Regression Model

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	T	Sig.
Constant	13.639	5.025		3.771	.000
Household inequality (family car, availability of books, access to internet, mobile phones, etc.) books					
Score	.315	.046	.581	9.023	.000

Table 3 above shows the coefficients. They are indicated where it is marked 'B' below the 'Unstandardized Coefficients'. The value of 13.64 represents estimated households' adaptations during the school closure, when found not to have any negative adaptations, and therefore have a score of 0. However, the co-efficient value of 0.32 indicated below, is an indication of the slope of the predictor value (the inequality in households) which is an indicator of an average decrease of adaption whenever there is a unit increment in households' inequality. Based on this, the estimated regression was seen to be this: households' adaptation score= 13.64 + 0.32 multiplied by (household) inequality, which is y=13.64+0.32 x +e, y being the dependent variable of household adaptation, x the predictor variable of household inequality and e the error in family response. With this equation between the variables, then there was the need to determine the level of significance of predictor (independent) variable through ANOVA test of significance in Table 4 below:

Table 4. ANOVA Test of Significance of the Predictor Variable

	Sum of Squares	Df	Mean Square	F	Significance
Regression	4731.093	1	4721.093	82.595	.000
Residual	14922.792	258	57.940		
Total	19643.975	259			

Testing the ANOVA test of significance of the independent variable at 5% significance level, the result as indicated in Table 4 above was significant considering the fact that the F-ratio was 82.60 with $p < 0.05$. This shows household /home inequality has significant contribution to household/family adaptation to household adaptions to school closure.

4.1 Access to Technology and Its Use and Children's Response to Remote Learning

Univariate regression analysis was used to determine the relationship in household inequality measured on the Family Affluence Scale on such items as: a) family owning or not owning vehicle; b) whether or not a family owns computers and how many; c) whether children had access to television; d) whether children had access to books outside of school during the closure; e) whether or not children had access to internet connectivity, etc. on one hand, vis-à-vis, time used by children either for engaged distance learning or for playing or loitering around in the homes:

Table 5. Univariate Regression Analysis of School Children during School Closure Using Family Affluence Scale Items as Predictors.

Measures	Time used in engaged learning		Teacher-student interaction		Home work	
	DR^2	Beta	DR^2	Beta	DR^2	Beta
Level of Household Affluence	0.013	0.101	0.049**	0.212**	0.010	0.084
Access to Computers	0.013	0.08	0.002	0.01	0.021*	0.11
Access to Books & Home tut	0.047**	0.224**	0.044**	0.216**	0.050**	0.232**
Internet Connectivity	0.000	0.020	0.006	0.076	0.009	0.094

Note: *p < 0.05. **p < 0.01.

4.2 Developing National Plans to Identify Pre-existing Inequalities

We tested whether or not home background differences (how pre-existing inequalities predicted time used in accessing remote online teaching and learning via technology engaged remote learning between households), existed in the variables using MANOVA analysis. We also conducted pretesting as a way to check for normality, homogeneity of variance-covariance matrices, normality, linearity, multi collinearity. Results are presented in Table 6 below:

Table 6. Respondents Scores on Family Background and Children's Number of Hours on Online Remote Teacher-student Interaction during the Closure

Dependent	Affluent		Non-Affluent				Between	Subject-Effect
Variables	Mean	SD	Mean	SD	Df	M Sq	*F*-value	*p*-value
Number of hours online with teachers	80.72	9.48	65.05	12.86	1	4623.83	28.25	.000*
Time engaged in learning Satisfaction	78.89	5.29	60.30	8.34	1	240.49	3.10	.075

Redressing digital Divide between disadvantaged and advantaged children from COVID-19 Experience (https://www.oecd.org/education/school/50293148.pdf)

Table 7. Respondents Scores on how Additional Spending for Children from Poor Background Have Proven Impact from COVDI-19 Experience

Additional spending for children from poor background and proven impact from COVDD-19I	N	Mean	Standard deviation
Parents	100	25.05	0.220
Students	150	22.89	0.311
Teachers	50	26.51	0.19

5. Discussion

Household inequality largely determined access/lack of access to technology, and therefore how different households in this report responded to remote learning through the use of internet and other technology devices during school closure. The more children scored high on the affluence scale indicators, the more they had access to digital availability and other resources during the lockdown. For example, in all, only 15% of children reported having more than three internet devices at home as well as only 10% having broadband and satellite internet compared to the overwhelming 75% of children respondents having no device or only one device or without any device at all. Those reported having adapted more positively to the remote on-line curriculum teaching by teachers, following online lessons, doing online examinations, and getting on line feedback from teachers from morning to about mid-afternoon, from Monday to Fridays, just as they were in school with physical teacher support were only some 25%. These children had little to lose during the closure. This was disproportionally the case with children from indigent households who score less on the affluence scale, and who reported in some cases having prepaid or dial-up internet access which for most of the time had network challenges, especially during the tropical rain months in April, June, July during the closure, and therefore could not all the time, had access to online remote learning. This suggests the link between household inequality and how these indigent children adapted to the lockdown. As a result of either total lack of technology access and use, or only one device or dial/ prepaid internet with network challenges, some adapted to the closure and its consequent remote learning by the following : a) either learning on their own for few periods of time (with little parental supervision) or spent most of the days playing around in the neighborhoods from morning to late evening, or if household had access to the radio, would tune in to listen to some educational programmes that were on offer by some state and private media houses. While more affluent households' children adapted to the new remote leanring through the use of zoom, Microsoft Teams and google classroom etc., to have virtual interactive meetings with their teachers, the less affluent adapted through the normal internet and WhatsApp, or through the radio, and the children from very poor households either learnt on their own and played around during the greater part of the lockdown.

Thus, limited systematic support from the homes of poorer students due to lack of digital access

appeared to have set limits to poor children in benefitting from remote learning compared to their colleagues from more endowed families. The findings in this study as reported in Tables 2 and 3, not only corroborate the report published by UNESCO, UNICEF and the World Bank (UNESCO, UNICEF & the World Bank 2020) data surveys on national education responses to COVID-19, that children from low as well as lower income countries were less likely to have access to remote learning, but also suggest that within low-income countries, the disparity between households were greater in countries with fragile economies (Giannini, 2020). Thus, while acknowledging that technology makes remote learning possible, it is not available to all globally (Giannini, 2020). The report here suggests that children in poor countries from poorer households had less advantage of remote distance learning via technology and thus confirming (UNESCO, 2020b; UNICEF, 2020). Additionally, the findings in this report strengthens the findings of Giannini (2020) and ITU (2020) that students having no access to the internet may differ from less than 15 per cent in respect of Western Europe and North America, while in the case of sub-Sahara Africa it could be as high as 80 per cent. The findings reported here support Coleman (2021) and Ofcom (2020) of a digital divide in education especially in terms of access as well across family/households' types, and student groups during the pandemic school lockdown. Thus, children from less skilled and poorer parents as indicated in our data here, were more likely affected by digital exclusion than children in higher-socioeconomic status, confirming that of Wolf et al (2021). Even though, some of these differences predates COVID-19, nevertheless, it is the pandemic that further compounded this digital inequality, disproportionately having negative impact on indigent communities both within and across countries (Montacute & Cullinane, 2021; Lee, 2018; www.eqoptech.org; Federal Reserve Bank of Dallas, 2016; Moore, Vitale & Stawinoga, 2018; Wolf, Aurino, Suntheimer, Avornyo, Tsinigo, Jordan, Samanhyia, Aber, & Behrman 2021; Johnson & Coleman, 2021, raising equity issues. Social distancing in learning which has been precipitated by the pandemic appears not only to have disrupted long established practices in education delivery (that of physical teacher support) in favour of a more technology-supported programmes which do not favour poor children (Federal Reserve Bank of Dallas, 2016; Moore, Vitale & Stawinoga, 2018) so far as there is digital divide. As shown here, the digital divide raises the question of the global efforts to give equal access to education. These efforts seem to be thwarted by "confronting the stubborn challenge of persistent inequality" (Rao et al., 2017, p. 1) and therefore poor children seem to have less chance of benefiting from the gains of modern education which is technology-based (cf. Rouse & Fantuzzo, 2009). Economic class seems to remain the number one predicting cause of disparities throughout the digital inequality stack (van Deursen &van Dijk, 2019).

The findings here suggest the need for governments in highly-technology deficient jurisdictions to address the digital gap, which is an example of economic class differentials (van Deursen and van Dijk, 2019; Robinson, Wiborg, & Schulz, 2018), especially as education access becomes more technology-based. There might be the need for other interventions from governments in less developed economies to intensify efforts to bring basic technology, such as internet accessibility to poor children/students (cf. Vaillancourt, et al 2021). Given the fact that educational institutions cannot solve all social problems, it must also be admitted that, it is these institutions (schools) that are the most likely place society can identify, and acknowledge

social disparity such as the technology divide.

6. Policy Implications

The outcome of this study suggests that the Covid-19 school closure with its consequent remote learning via technology has starkly underscored the need to address the digital divide. Contemporary increased technology-based curricula do favour those on the positive side of the digital gap, preventing already vulnerable children from indigent households to access digital-based remote learning during the school lockdown. This exacerbated the already widening gap. Governments, especially in Sub-Sahar Africa may need to rethink the persistent digital gap in the context of the seeming ever-increasing incorporation of technology into school curricula. The pandemic is a call for a critical re-balancing, specifically of efficiency and resilience, in every aspect of technology access and use, to help bridge the gap. It is important that in less developed economies, there may be the need to develop a more enduring role in the post-COVID-19 era to promote a more inclusive technology access and use.

7. Conclusion

The findings suggest both high economic as well as social costs for many individuals across communities with respect to digital divide as teaching and learning become more technology-based. How children from different households adapted to the remote learning via technology in the absence of physical teacher presence during the lockdown was directly correlated to household inequality. The school closure not only disrupted normal teacher-student physical presence, but its technology-related adaptions to modern remote on-line learning exacerbated the already widening gap between households. This digital divide prevented already vulnerable children from poor households from accessing remote learning during the lockdown. Even though, the COVID-19 school disruptions was unexpected, nevertheless, it has a given a proven lesson about the increasing wave in which teaching and learning in contemporary education are becoming more digitalized and technology-based. Given this lesson from the pandemic lockdown in which already disadvantaged children had little or no access to technology to follow remote learning, compared to their peers, there may be the need for governments in digital-deficient countries to find ways to help cushion the wide-gap between technology access and use.

8. Limitations

The leading flaw of this paper is that the investigations were undertaken during the time when the COVID-19 pandemic was at its peak with lockdown. Information was gathered via telephone and e-mail. Respondents were psychologically stressed up for being confined to the homes. Some responses to the questionnaire could therefore have been compromised as a result of the stress of the lockdown. Besides, this study was conducted in only one city out of the sixteen (16) regions of Ghana. Therefore, data reliability could be compromised in terms of

their representativeness. This notwithstanding, the findings as reported here, give some valid indicators of the reality of the disparity in technology access and use by households during the period in this study area.

9. Further Research

As explained under the limitation, this study was conducted in an anomalous time when things were difficult and stressful in an urban area. It may be interesting for further studies to be conducted in a normal period and compare households' inequalities and technology use between urban, suburban and rural areas in the context of the lesson learnt from the pandemic regarding technology access and use.

Declaration of Competing Interest

This author has no known conflict of interest to disclose.

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