

Assessment of Digital Technology Economy in A Developing Nation the Digital Divide Implications

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Abstract

This study examined the assessment of digital technology economy in a developing nation: the digital divide implication. The benefits of technology with its advancement is beyond staying on the level of mediocrity for any average age person in this contemporary time. Students at every stage of academics are expected to have equivalent knowledge of technology and the ability to effectively handle the digital devices entailed. The study sort to find the reasons for gaps in the engagement of digitalization by some learners and instructors in the teaching and learning processes. 120 Senior Secondary School II (SSSII) Mathematics students from selected schools formed the sample for the study. Qualitative research of survey type was adopted and a validated reliable self-developed questionnaire tagged "Technology Literacy Assessment Questionnaire (TLAQ)" was used to collect data from students for the study. Findings showed that students' area of interest in the use of phones, parents' attitude to the use of phones by the students and the economic status of the parents, promoted digital divide. It was discovered that learners have interest in technology especially the use of phones but not in for academic activities. The economic status of parents and their technological awareness have been observed to promote digital divide. It was recommended that government should come to aid by providing needed devices and device- aids such as power supply as a source of reducing the extent of digital divide. Similarly, parents are to provide smart phone for their children for effective teaching and learning of Mathematics. Learners should be guided towards the use of phones for academic purposes.

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Introduction

The dividend of technology cannot be over emphasized since its emergence in 1970s (Michelle, 2009). (Zakaria & Khalid, 2016) described ICT since its integration into education as a tool for teaching and learning and a catalyst that propels a student to perform better in his/her academics. Technology in education involves digitalization. This is the strategy or process of utilizing digital technologies (involvement of computer) in the teaching and learning processes for better productivity. It is the decisive integration of digital technologies into the learning processes for the improvement on the learning outcomes. Digitalizing our learning activities can also be described as the process of changing from analog to computerization. Going digital in teaching and learning evokes many benefits and has been proved to be effective and productive beyond measure, especially in the subjects considered difficult by learners such as Mathematics (Kaware & Sain, 2015). Inability to explore and enjoy these benefits could be attributed to innumerable reasons of which digital divide is prominent. Digital divide is the gap that exists between individuals who have access to Information and Communication Technology (ICT) and those who lack access. (Hilbert, 2015) described digital divide as “Digital Inequality” in terms of digital communication capacity. This explains the difference in level of skills that could be demonstrated by individuals in the use of technology. Digital divide cuts across continents of the world, only that it is positively skewed in developing and under developed countries (Joao, et al, 2020). The causes of digital divide is divergent (Zakaria & Khalid, 2016). Arai and Naganuma (2010) described geographical location as a major factor that causes digital divide. Other highlighted factors include internet connectivity obstruction, digital devices accessibility and cost of acquiring and the maintenance of digital devices. Silver and Johnson (2018) observed that greater percentage of the people in sub-Sahara countries use basic phones that cannot be used to access the internet. Majority of women especially in the local environment consider the time use navigating on phone as a waste of time. Hilbert (2011) in the study titled Digital Gender Divide or Technologically Empowered Women in Developing Countries? A Typical Case of Lie, Damned Lies and Statistics observed that fewer women access and use ICT because of unemployment, education and income. Since digitalization has become the optimistic vision globally, the problem of digital divide is a “must tackled” issue (Jan & Dijk, 2019). Digital divide in education sector brings clear demarcations between the learners that are computerists and the mediocre. This also can lead to digital illiteracy and social-media-phobia or technophobic. The outcomes of digital divide in education can be dangerous to the individuals, the society, nations and can be a threat to the future in all ramifications. Illiteracy in terms of the benefits of the use of technology in education could be a considerable factor or the reason upon which some parents refuse or prevent their children in basic schools from using phones. Every field of human endeavours in this twenty- first century is based on digital technology of which Mathematics as a core subject is one. Mathematics is a tool that promotes critical and analytic thinking, strengthens and toughens mind. It helps in making us efficient in our plans and execution of our daily chaos. Mathematics stands out in its relationship with other field of endeavors. To crown it is the involvement of mathematics in the source of breath of nations’ economy which is technology. Perfect management of economy by individual, family or nation-wise is not independent of mathematics. A subject of innumerable value like this should not be left out of this ear of “learning in internet”. Learners performance in mathematics have always been tagged unsatisfactory (Enu, Agyman & Nkum (2015). There are several factors identified to be the cause of this appalling failure (Ayebale, Habaasa &



Tweheyo, 2020). Since digital pedagogy has been viewed productive, every effort to debase digital divide should be delve into to improve learners' performance in Mathematics.

Statement of the problem

The advancement in technology and its myriad benefits especially towards education is tending towards the point that every Mathematics student should be able to utilize digital devices based on the level he/ she belongs. Students in secondary schools write JAMB and Post JAMB examinations before getting admission into higher institutions. These examinations are Computer based Examination (CBE). Observations showed that some learners are far from expectation in the use of technological devices such as Smart phones, Tablets, Computer, with the Computer Applications while some students are opposite. This discrepancy is called "Digital divide". Hence, this study sort to establish the factors that are responsible for these inequalities or gaps with cognizance on the parents and the students. The purpose of the study is to establish the Assessment of digital technology economy in a developing nation: The digital divide implications. The study sort to establish the causes of Digital divide with the focus on the learners of Mathematics in this era of digitalization. The study considered the interest of the learners and the contribution of the parents' economic status to the advancement of students in the area of using appropriate phones in the learning of Mathematics. Also, the study examined the effect of parents' attitude towards the use of smart phones by the leaners. Accessibility of smartphones by the learners was also examined.

Research Questions

The following questions were raised to guide the study;

1. Does students' area of interest in the use of phones promote digital divide?
2. Does parents' negative attitude to the usage of phones contribute to digital divide among the students?
3. Does parents' economic status promote digital divide digital divide among the students?

Literature Review

Mobile phone is a communication device that uses voice, SMS or MMS. There are three categories of phones; Basic Phones: These can only make voice calls, send and receive SMS messages and make use of USSD (Unstructured Supplementary Service Data). Feature Phones- added to the feature of basic phone- cameras and increased storage, as well as ability to access the internet. It has a standard numeric keypad- (called QWERTY). Smart Phones- offer advance capabilities and features over feature phones. It allows user to add applications. Most have 3G (Third Generation) as well as WI-FI (Wireless Fidelity) capabilities and generally have a QWERTY keypad. Smart phone has big screen than feature phone. Silver L. & Johson, 2018 describes mobile technology as a tool to support students' learning activities. The boredom and abstractness of mathematics are being reduced as researchers are exploring some facts about the teaching and learning of mathematics with better consideration to digitalizing teaching strategies that make teaching and learning easy. Example is the involvement of simulation, animation gaming, blended learning, Google classroom, smart-board, and social media tools such as WhatsApp, facebook and instagram. All these boost interaction and communication between students and the teacher and also within students. Researches about the teaching and learning of mathematics is a continuous agenda as far as the pedestal is not yet reached. Silver L. & Johson observed that majority across the sub-Saharan Africa own mobile phones but smartphones adoption is modest. Pew Research Center buttress this by its discovery that basic phones are most common type

Sacristan, Parada and Miranda (2011) discovered that over two-third of Mathematics teachers in high school that were selected as sample in UK did not have basic ICT skills, hence, not able to use technology in their lessons. This study was carried out in a developed country, if such a large number of teachers was not technologically inclined, how would they be able to guide students to the enjoyment of the benefits of technology in their teaching processes. This is a great challenge in the developing and under developed countries that formed the greater part of the world is already at hand. Ambati, El-Gayar and Nawar (2020), explained the role of Digital Divide as a bridge between socio-economic factor, health status and health information in the area of information purpose and E-health status. Digital Divide can be of different forms such as; access to internet connection, access to laptop or smartphone.

Theoretical Frame work

This study was based on the Theory of Digital Divide (TDD) and ICT Engagement Theory (ICTET). (TDD) postulated that there is an economy and social gap between the population of a nation and its access to technologies pertaining to information and communication. This theory emphasizes the position of economy of a nation and an individual in the exposure to and the degree of one's accessibility and usability of technological devices. Since it has been globally accepted that the involvement of technology in the teaching and learning improves learning outcomes, some factors that have been inhibiting the free course of technology should be examined. Provision of solutions to such impediments brings technology to the door step of both instructors and learners of a valuable subject like mathematics.

ICT Engagement theory describes ICT literacy as "the interest, attitude, and ability of individuals to appropriately use digital technology and communication tools to access, manage, integrate, and evaluate information, construct new knowledge, and communicate with others in order to participate effectively in the society. The theory establishes the realities behind the ability to appropriately deal with modern information and communication technology (ICT), that is, ICT literacy. Coined from the theory, adolescents use ICT for various activities outside of school ranging from playing computer games to preparing presentations for school and using social networks. In particular, they use ICT more often for entertainment and social interaction than for information and learning-related purposes. This deepened the needs for the teacher to be acquainted with the benefits of being verse in digitalization so that they can fine-tune the learners' way of using networking to enhance their performance in academic activities. The theory stressed the factor of interindividual differences in ICT which exposes the specific area of individual digital divide. Self-presentation has to do with exposing one's area of weakness in the use of ICT. This will enable any profound help in whipping digital divide that blurs the genuineness of digitalization in some parts of the world.

Methodology

This research is a quantitative descriptive type that adopted survey design. The population for the study consisted of 120 Senior Secondary School two (SSSII) students randomly selected from three public secondary schools in Ekiti State. Self-designed research instruments tagged "Technology Literacy Assessment Questionnaire (TLAQ)" was used to collect data from the students. The instrument contains items in sections as concord to the desired areas to be investigated; Student's area of interest in the use of technological devices (Smartphone); Parents' negative attitude to the usage of phones and Parents' economic status. The instrument were validated for face and content validities by experts in the field of Mathematics Education and statistics. Items considered to be inappropriate were weeded

and others reshuffled before administration. Permission was taken from the concerned authorities of the schools before the administration of the instrument. The Mathematics teachers for SSS II in the selected schools assisted in the distribution and collection of the instrument. Data collected were analyzed descriptively using percentages.

Results

The findings of the study were organized as spelt out in the research questions based on the foci of the study and discussed accordingly.

Research question 1: Does students' area of interest in the use of phones promote digital divide?

Table 1: Descriptive analysis showing Student's area of interest in the use of technological devices (Smartphone)

S/N	Statement	SA	A	D	SD	REMARK
1.	I like a smart phone	120(100%)	0(0%)	0(0%)	0(0%)	Strongly Agreed
2.	I like charting on phone	115(95.83%)	5(4.16%)	0(0%)	0(0%)	Strongly Agreed
3.	I like doing assignment with phone	25(20.83%)	35(29.17%)	33(27.50%)	27(22.50%)	Agreed
4.	I like instant mail chatting	111(92.50%)	9(7.50%)	0(0.00%)	0(0.00%)	Strongly Agreed
5.	I like group work using phone	24(20.00%)	20(16.67%)	33(27.50%)	43(35.83%)	Strongly Disagreed
6.	I like sending and receiving WhatsApp messages	120(100%)	0(0.00%)	0(0.00%)	0(0.00%)	Strongly Agreed

Table 1 showed the areas of interest as indicated by the respondents on possessing and usage of smartphones. Item 1 on the table showed that all the students (100%) strongly agreed that they have interest in the use of smartphones. Item 2 revealed that students strongly agreed (100%) on charting with phones. For item 3, 29.17% of the students agreed that they like using phone for assignments. 92.50% indicated that they like instant chatting. A greater percentage (63.33%) of the respondents disagreed with item 5. The students strongly agreed (120%) to item 6.

Research Question 2: Does parents' negative attitude to the usage of phones contribute to digital divide among the students?

Table 2: Descriptive Analysis Showing Parents' negative attitude to the usage of Phones by students

S/N	Statement	YES	NO	REMARK
1.	My parents encourage the use of phone in the school	48(40%)	72(60%)	Negative
2.	My parents bought smart phone for me	36(30%)	84(70%)	Negative
3.	My parents use smart phones	53(44.1%)	67(55.9%)	Negative
4.	My parents use basic phones	63(52.5%)	57(47.5%)	Positive
5.	My parents always have data	43(35.8%)	77(64.2%)	Negative
6.	My parents have a functioning generator/inverter	31(25.8%)	89(74.2%)	Negative
7.	My parents are on WhatsApp platforms	48(40%)	72(60%)	Negative
8.	My family has a WhatsApp platform	38(31.7%)	82(68.3%)	Negative

From table 2, item 1 showed that greater percentage 72(60%) of the respondents indicated that their parents did not encourage the use of phones. Also, negative response to item 2 by respondents showed that some parents did not buy phones for their children. The responses to items 3 and 4 by the respondents indicated that majority of their parents were not using smartphones. Responses to items 5 and 6 showed that greater percentage of parents lacked the means of effective networking. Also, responses to items 7 and 8 revealed that a greater percentage of parents did not engage WhatsApp platforms.

Research Question 3: Does parents' economic status promote digital divide digital divide among the students?

Table 3: Descriptive Analysis Showing Parents' Economic Status

variables	Low	Average	High	total
Farmers	32(26.67%)	13(10.83%)	6(5.00%)	51(42.50%)
Traders	12(10.00%)	9(7.50%)	4(3.33%)	25(20.83%)
Civil Servants	17(14.17%)	10(8.33%)	17(14.17%)	44(36.67%)
Total	61(50.83%)	32(26.67%)	27(22.50%)	120(100%)

Table 3 showed the economic levels of parents. The highest percentage of parents belong to the low earning class (50.83%). The percentage of parents in average economic class was 26.67% while the parents in high economic class was 22.50%.

Discussion

Drawing from the findings of this study, it was observed that students have interest in the use of smartphones but not for academic purposes. This is in accordance with the findings of Nwachukwu and Onyenankeya (2017) that showed the frequency of students' usage of phones for various activity. It was found that the frequency of using phones to perform academic activities was very small compared with the frequency of chatting with friends, playing games, listening to music and browsing the internet. As much as students have made phones their inseparable companions, its use for academics' engagement has a very low percentage (Ataş & Çelik, 2019). Specifically, it was observed that students have much interest in the use of WhatsApp. Virtually, all the students showed their interest in the use of WhatsApp. Despite the fact that it is a social platform that permeate free teaching and learning activities, if instructors do not engage it with their students on academic purposes, digital divide will be promoted and Leveraging digital technologies and the demonstration of expertise in the use of basic skills could be very low. It was discovered that the attitude of parents to the use of phones by students was not encouraging. This could be attributed to several reason such as the fear of becoming addicted to it at the detriment of their academics, time wastage and negative implications to health. The worry of many parents could be about the negative effects of the way youths engage internet in fraudulence acts. Illiteracy could also be a challenge, parents that are not learned may not understand the value that phones can add to the performance of a child academically. Depriving a child access to a smart phone would contribute to digital divide because the he will not know many things about the use of phone.

The study established the economic status of parents of the students. Many parents in this side of the glob wallow in abject poverty. Paul (2005) observed that children living in high-income households have more access to home computer and internet than children living in low-income households. Aye bale, Habaasa and Tweheyo (2020) were of the opinion that

parents should be role model and encouraging factor in the home and holding particular attitude that will foster their children's learning. Zhao, et al, (2018) submitted that smartphone has formed an integral part of every student, therefore, they should be tailored towards the beneficial aspect that will lead to their betterment.

Conclusion

This study examined the assessment of digital technology economy in a developing nation: the digital divide implications. Technology has become the language of the world due to its immense benefits. Learners are not to be far from the use of technology as it is capable of determining the future as new ideas evolve and are being inculcated to every facet of life. The involvement of technology into education practices such as using computer for examination is a genuine reason why a child should be conversant with the use of digital devices such as smart phones. Inability to move at the expected pace with technology advancement is described as digital divide. Hence, this study established the factors that promote digital divide. The interest of the child in dealing with technological device such as smart phone, the attitude of parents toward the use of phones by their children as students and the socio economic status of the parents have been identified to be reasons behind digital divide in developing nations like Nigeria. The area of student's interest in the use of phones germane, if it is only to play games that are not educative and chatting with friends, such a child will not be able to navigate to educative applications. The negative opinion of some parents about the use of phones by their children had contributed to social divide on the side of students hereby depriving learners of technology impacts on the improvement of their performance in important subjects such as Mathematics. Low income generated by parents leads to weak supply of the needs of students. Improvement upon these identified factors would conversely affect digital divide in the society.

Recommendations

Based on the findings of this research, the following points were recommended:

- Students should be guided by the teachers to use phones for academic activities.
- Parents should be educated by the school in collaboration with the government about the benefits of using phones in academic activities.
- Parents should provide smartphones and needed accessories such as powerbanks and Memory cards for their children and make adequate supply of data.
- There should be financial implications from the Government to complement the efforts of the parents.

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