Socioeconomic Inequalities and Digital Access in Nigeria Education: Evaluating the Economic Barriers to Educational Technology Adoption

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Abstract: This research studied the economic dimensions of the socio-economic inequities of digital access and EdTech use in schools in Nigeria. The digital divide and technology acceptance were utilized in exploring the effects of income and funding of schools on access to devices, Internet and teachers' ICT skills. A mixed-methods design was implemented where 450 respondents in urban and rural areas were sampled using multistage sampling. Quantitative data ($\alpha = 0.82$) were analysed descriptively, using correlational and regression techniques, and t-test while the qualitative data obtained through interviews were analyzed thematically. The findings confirmed that socio-economic status is a major predictor of digital access ($r = 0.63$, $p < 0.001$) and that EdTech has significant adoption barriers $F(4,445) = 39.27$, $p < 0.001$) and that the gap between urban and rural areas is significant $t(448) = 11.46$, $p < 0.001$). The study suggested that devices should be subsidized, data costs lowered, funding increased, teachers trained, and digital infrastructure strengthened.

Keywords: Digital Technology, Educational Technology (EdTech), Economic Barriers, Socioeconomic Inequalities

1. Introduction

The impact the COVID-19 pandemic had on education systems across the world was the deconstruction and amplification of the previously existing inequities in the access to education. Nigeria was not an exception. Nigeria's school shutdowns and the ensuing remote educational instructions historically demonstrated that the ability to access digital education was economically and regionally inequitable (Azubuike, Adegboye, & Quadri, 2021). Even when educational systems worldwide try to integrate digital resources to be used in face-to face and remote instructions, there is always the economic barriers of device affordability, constant data cost, weak microeconomic circulation that prevents the low- income educational consumer public and the under resourced schools to adopt the mechanisms in a meaningful way. (World Bank, 2025; ITU, 2023).

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An inequitable educational system is always going to be the result of what is now called a digital skills second-order infrastructure, where those that want to use technology for educational purposes, lack the necessary skills, resources, and public wealth investments to do so (World Bank, 2025; Barikzai, 2024). Given the above, these interlocking constraints imply that educational technology (EdTech) is more likely to reinforce than ameliorate existing socioeconomic inequities unless policies and finance strategies to support educational systems in implementing education technology systems prioritize cost of access and affordability (EdTech) Muraina (World Bank, 2025).

It has been argued that even while Nigeria was going through the COVID-19 pandemic, there was an even greater opportunity gap for school continuity among children of affluent families, especially those attending private institutions, due to the fact that they were more likely than their peers in terms of to attend live remote classes, possess, and or share functional devices that are supportive of digital learning and benefited from the appropriate parental support during the school closure periods (Azubuike et al, 2021). Further, there has been uniform information, both locally and internationally, that due to deficient infrastructure, Nigeria has one of the lowest levels of Internet access and availability of fixed broadband within its borders as compared to the rest of the world, which makes Nigeria's lack of infrastructure, access, and education technology a significant economic challenge (ITU, 2023). Meanwhile, more recent policy assessments and sector studies have also highlighted that simply closing the 'first level' access gap, is not only necessary, but also critical for establishing an enduring solution to the problem, instead of shallow interventions such as targeted subsidies, lower data prices, government funding for digital devices at schools, training of teachers, and investments in educational technology, which will disproportionately result in more privileged communities benefiting from it (World Bank, 2025; Barikzai, 2024).

This study examined the economic barriers that shape how socioeconomic inequality relates to digital access within the Nigerian educational system. Going beyond simple descriptive analyses, it examined the combinations of household income, the immediate expenditures on educational technology and data, and the institutional funding (school budget, government, and donation assistance) that collectively shape the capacity of schools and their students to embrace educational technologies. The study attempted to devise practical policy interventions aimed at digital learning system inclusions through macro-level measures of connectivity, public expenditure and strategic procurement, or price controls on digital learning resources and services. This study sought to assess the educational technology (EdTech) inequity undermined by economic factors and socioeconomic inequality as it relates to digital access and EdTech assimilation within households and educational institutions in Nigeria. This study centres on the following goals:

1. Determine the relationship between household socioeconomic standing (income, parental education, rural/urban residency) and students' access to learning devices and the Internet.
2. Investigate how recurring expenditures (mobile/ data costs, electricity) as well as one-time device costs predict the rate of EdTech assimilation at school and household levels.
3. Assess the patterns of institutional financing (school budgets, government/donor funding) and their connection to the preparedness of schools to engage in digital learning.
4. Invest in policy formulation and evaluation (subsidies, procurement, price control, digital literacy) likely to close the economically driven gaps in the availability of digital tools.

1.1 Research Questions

1. To what extent do the socioeconomic status of the family and household correlate with students' ownership/use of devices and Internet access for educational purposes?
2. To what extent do ongoing digital expenses and devices, price of the equipment affect household and school decisions?
3. What are the financing options that are available to (or that constrain) school preparedness for digital learning in Nigeria?
4. What are the most effective policy changes likely to lessen the economic constraints to the equitable adoption of EdTech?

1.2 Research Hypothesis

H_{01} (Null hypothesis): The socioeconomic status of the household (income and education of the parents) does not have any statistically significant influence on access to devices and Internet for learning by the student.

H_{11} (Alternative): The higher the status of the household, the higher the access to devices and Internet for learning.

H_{02}: Recurring costs to the digital resource (data, electricity) and the price of the devices do not have a significant influence on the EdTech adoption by a household or a school.

H_{12}: The higher the recurring costs to the digital resource and the price of the devices, the lower the probability of EdTech adoption by the household and the school.

This investigation proposes to generate policy-specific implications evidence to address Nigeria's education digitally induced inequalities by closing economically motivated digital divides and by also preventing digitalization from worsening inequalities to establish digitally inclusive education.

2. Theoretical literature Review

Within Nigeria's education systems the access of the population to digital education is highly unequal and there is a socioeconomic dimension to this inequality. Any understanding of this dimension must incorporate a number of different theoretical perspectives to understand the influence of economic structure and the social dimension inequalities that guide the adoption and use of educational technologies.

For this purpose, four theories can be used: The Human Capital Theory, the Technology Acceptance Model (TAM), the Digital Divide Theory and the Capability Theory. Each of these theories will give additional insights and value to the understanding of the economic constraints that exist towards the adoption of educational technologies (EdTech) in low-income contexts.

2.1 Human Capital Theory

Education and the development of skills are positive capital investments (Becker, 1993). Becker posits that with these investments, there are gains in productivity, equal access to jobs, and benefits to society in

the long run. Recent studies have extended the theory to include the human capital of access to technology digitally and its competencies, pointing out that access to technology is a necessity for the participation in and productivity of contemporary economies (Okolie et al., 2022). Ogunode and Abubakar (2023) pinpoint the Nigerian context in which the lack of digital instruments, internet access, and digital educational platforms availability results in human technological skill deficits. These deficiencies human capital are primarily the effects of poverty. Socioeconomic disparities, thus, greatly reduce the potential of digital human capital creation. This creates a pattern of deficits on a community for successive generations. These issues help form the basis of the theory in this particular studies logic, where the economic factors such as the cost of devices, data, and the lack of investment in infrastructure are the strong bottlenecks to which factors live for the 21st century to acquire the vital skills as education merchandise for 21st century.

2.1.2 Technology Acceptance Model (TAM)

TAM suggests that perceptions about the usefulness and ease of use impact the rate of technology adopted (Davis, 1989) and most recent application of the model in developing countries illustrates how perceptions of technology use being wordless, in expensive, difficult to access and use, and lack of digital literacy and infrastructure (Afolayan et al., 2023). In educational settings with limited resources, the adoption of educational technology remains low when the perception of usefulness is high, but economic constraints high, exorbitant data costs, and unsteady power supply dictate impractical usability (Muraina, 2025). The impact of socioeconomic inequities on the adoption of digital learning tools is why the model applies to the present study. Schools with limited financial resources have greater constraints in acquiring the necessary devices, sustaining the ICT labs, training staff, thus reducing the perceived value of the devices and hindering adoption.

2.1.3 Digital Divide Theory

Digital Divide Theory explores the uneven distribution of digital resources such as the Internet and devices, as well as the digital skills needed to use the internet and devices across socio-economic, geo-political, and demographic groups (Norris, 2001). Recent scholarship distinguishes three types of digital divides: first order divides (access to digital devices), second order divides (the ability to use and engage meaningfully with digital devices), and third order divides (the ability to obtain the benefits of digital technology) (van Dijk, 2023). In Nigeria, the first order divide is primarily influenced by the economic costs associated with purchasing smartphones, laptops, and the broadband subscriptions, while second order divides stem from digital illiteracy resulting from inequitable and inadequate digital training provided by schools (ITU, 2023). Hence, there is greater integration of educational technology in wealthier households, as well as private schools, to the detriment of low income families and rural public schools (Azubuike et al., 2021). This study invokes Digital Divide Theory, as it captures the complex relationship between socio economic disparities and the resultant inequities in educational access and achievement.

2.1.4 Capability Approach Theory

Amartya Sen's Capability Approach Theory emphasizes that development is not a matter of acquiring resources, but of comprehending real freedoms and of advancing that that people are able to achieve (Sen, 1999). Scholars are starting to applying this framework to digital inclusion, arguing that access to

technology is a capability that make it possible for people to engage fully in education, society and the economy (Gómez & Pathar, 2022). In the case of Nigeria, given that there are considerable socio-educational inequalities in the country, Nigerian students' digital capabilities are curtailed by their inability to use technology to learn, create, and solve problems. Even when learners have access to digital gadgets, their EdTech related real freedoms are curtailed as a result of affordability issues, insufficient institutional funding, and low digital literacy levels (World Bank, 2025). The Capability Approach, therefore, gives rationale to the focus of this study on the economically induced constraints on students' digital opportunities.

The integration of these theories outlines the framework that will be used to assess the adoption of EdTech in the context of Nigeria's socioeconomic disparities: Human Capital Theory, TAM, the Digital Divide, and the Capability Approach. Human Capital Theory explains the need for certain digital skills because restricted access comes with educational and economic advancement costs over time. TAM Theory incorporates economic limitations to frame perceptions and adoption responses at the school and household levels. Digital Divide Theory addresses socioeconomic exclusion as the primary reason for digital exclusion (focus of the study on economic barriers). Finally, the Capability Approach to educational access and equity addresses digital access in the context of access to substantive participation, which aligns with cost, adequate supporting infrastructure, and institutional commitment. Combining insights from the above theories explains the impact of socioeconomic status on digital access and the extent to which economic barriers the adoption of educational technology. It also outlines the requirements needed to achieve Nigeria's digital education equity to include all Persons.

2.2 Empirical Literature Review

Empirical studies have begun to examine the gap between socioeconomic inequality and the varying levels of access to digital learning resources within the Global South, Nigeria, and the like. Within the COVID-19 lockdown period, Azubuike, Adegboye, and Quadri (2021) affirmed that higher income households in Nigeria were more likely to attain remote learning due to the possession of smartphones, home internet access, and learning supportive homes. Ranging across several states in Nigeria, the researchers determined that the most influential predictor of online learning accessibility by students was the affordability of digital devices and data subscriptions.

Likewise, Afolayan, Dare, and Oladipo (2023) identified that the primary cause of university students' acceptance of educational technologies was limited by economic factors such as high Internet accessibility, and the absence of laptops and tablets. Notably, students recognized the EdTech tools to be useful; however, the adoption of such tools was restricted by the high recurring expenses. Thus, affordability was a barrier in both access, and usability. Additionally, Muraina (2025) stated a similar argument, where high data costs, unstable electricity, and low digital literacy level were the main reasons that e-learning was sub-optimally adopted among undergraduates. His study brought to the fore the fact that socioeconomic status determines the extent to which students can sustain the digital learning in the long run, rather than just the initial access gap.

Inadequate integration of EdTech and the lack of ICT infrastructure was displayed in Ogunode and Abubakar (2023), in which the authors examined the public schools in low-income areas. Lack of school

funding resulted in digital skills teacher competency limitations detailing the divisions in competencies and skills. The Telecommunication Union (2023) reported, unqualified broadband access in Nigeria is relative to the low income and rural areas. Inequitable access between urban and rural areas negatively impacts the rural students which suffer more digital exclusion. These observations, which include Nigeria, have also been reported in several countries in Sub-Saharan Africa. The ICT resources vis-a-vis digital skills and employability outcomes were demonstrated by Okolie, Igwe and Nwosu (2022) to strongly correlate access which was determined by socio-economic background. As in, country constraints, the level of education of parents, household income, urban-rural residence was highlighted by Gomez and Pather (2022) in digital participation and capability. According to The World Bank (2025) without public funding and subsidies, focused digital education and learning will reinforce the educational deficit, inequalities, digital educational deficits. The World Bank (2025) states without subsidies and directed public digital financing educational inequalities will be consolidated further. Additionally, uneven socio-economic backgrounds create strong digital educational deficits disproportionately.

Across Nigeria and similar contexts, empirical evidence converges on the view that economic barriers-device pricing, data cost, infrastructural shortcomings, and lack of digital access and the adoption of EdTech. However, these factors operate unequally across the socioeconomic spectrum, worsening inequities in learning opportunities.

2.2.1 Research Gaps

There is empirical evidence of digital inequality in Nigeria, but it has not yet closed the following gaps:

First, most studies still consider individual economic factors (e.g., the cost of a device or data) in a silo, and do not consider the combined impact of numerous economic factors such as device cost, data pricing, electricity, and school funding on EdTech adoption. This study attempts to fill this gap by examining economic barriers as networks of interrelated determinants instead of factors of isolation.

Some studies focus on the household (e.g., Azubuike et al., 2021), and others focus on the school (e.g., Ogunode & Abubakar, 2023), but very few analyse both the socioeconomic status of the household and the financing capacity of the school in one study. This study is the first to do this and to examine both levels in a comprehensive manner.

Many studies conducted in Nigeria characterize the digital divide but do not attempt to explain the phenomenon from the perspective of theory, be it the Technology Acceptance Model (TAM), Human Capital Theory, Capability Approach, etc. This study uses theory as a foundation to explain disparate socioeconomic conditions and contribute to research in this area.

Most of the available empirical work studies the period of the COVID-19 pandemic. There is little evidence after 2022 assessing the presence of economic obstacles to the adoption of Ed-Tech as Nigeria moves to blended learning. This study aims to provide the empirical evidence for the period 2023-2025.

Few studies assess the impact of specific interventions such as subsidies, regulation of data costs, public procurement, and infrastructure financing on digital and, more severely, on economically depressed digital

access. This research seeks to close this gap by proposing specific, actionable policy levers to mitigate socioeconomic-related disparities of digital access.

The socioeconomic inequalities that influence digital access in Nigeria have been well documented. There is, however, no comprehensive, multi-theoretical, multi-level analysis that attempts to simultaneously consider the economic capacity of the household, the recurring affordability challenges, and the availability of financing, as well as the overall multifactorial context of EdTech adoption. This study attempts to bridge these gaps by proposing an integrated empirical work and actionable public policy to mitigate economically caused digital exclusion.

3. Methods

To study the impact of socioeconomic factors on the digital divide and technology use in education, this study was the first of its kind in Nigeria, using a mixed-method approach. Participants in the study included secondary school students, teachers, and administrators of selected public and private schools in a diverse socioeconomic sample of 3 states in Nigeria. Three states in Nigeria with different socioeconomic profiles were chosen. In this study, a multistage sampling approach was used, and the sample size was estimated using Cochran's Formula from 1977, as follows:

$n_0 = Z^2pq / e^2$

$Z = 1.96$ at 95% confidence level, $p = 0.5$ (estimated proportion of population with the attribute), $q = 1 – p = 0.5$, $e = 0.05$ (margin of error)

Based on the aforementioned variables, $n_0 = (1.96^2 \times 0.5 \times 0.5) / 0.05^2 = 384.16$ which would round to 385.

The sample was somewhat adjusted to 450 to bolster representation over subgroups and to account for non-response. Primary data were gathered using closed-ended questionnaires measuring the socioeconomic status and digital access and educational technology barriers, and 20 school administrators were interviewed to obtain secondary data on the insights of the architecture and finance problems that were more constrained. Construct validity was established using a review by an expert, and a pilot test. Reliability analysis using Cronbach's alpha point to a high degree of internal consistency, as shown by the 0.82 which was significant. For this research, quantitative data, which consisted of survey responses, were carried out using descriptive statistics, correlation, and multiple regressions, and qualitative data from interviews were analysed using thematic analysis techniques, which helped to enrich the quantitative data findings. The research underwent ethical review, where informed consent and confidentiality were maintained and anonymity of the participants of the survey and interviews were not revealed, allowing for a thorough triangulation of the economic barriers to digital access in education in Nigeria.

3.1 Data Analysis

As part of the mixed-method approach of the study, data analysis also proceeded systematically. For quantitative data, responses to the structured questionnaire were coded before being entered into the Statistical Package for the Social Sciences (SPSS Version 26) for analysis. During analysis, data were

screened for completeness, outliers, and normality for quality control and suitability for testing. Socioeconomic characteristics of respondents, digital accessibility, and economic barriers to EdTech adoption were summarized through descriptive statistics, frequencies, means, and standard deviations, which were built to assessed respondents. Inferential statistics were then employed to study the hypotheses of the study. Pearson correlation analysis was employed to determine the degree of association of socioeconomic status, digital access, and technology adoption. Multiple regression analysis was then conducted to determine the extent to which economic variables (device affordability, data cost, electricity cost, and school funding level) predicted educational technology adoption as reported by study participants. For subgroup comparisons, independent-samples t-test and one-way ANOVA were employed as appropriate. Qualitative data from the semi-structured interviews were transcribed verbatim, then analysed thematically to identify patterns around institutional financing and contextual socioeconomic inequities using coffee and Clark's (2006) approach. The findings were integrated during the final stage, which was interpretation. This allowed for triangulation and a profound understanding of the economic challenges restricting digital education in Nigeria.

3.2 Instrument Validation

It was incredibly important to work on confirming the coherence and appropriateness of assessment and measurement materials to guarantee the precision and transparency of the equipment used in validation. The research ensured the content validation of the questionnaire and the interview guide assistance of three experts in educational technology, measurement and evaluation and socioeconomic policy. Each of them examined the relevance, transparency, and alignment of the items with the study goals. Such feedback allowed me to revise the unclear items and improve the indices on the economic barriers, digital accessibility, technology adoption, and adoption frameworks. To test the reliability and the stability of the questionnaire, we conducted a pilot study on 40 people representing a similar population, but from a different geographical area than the core of the study. The data obtained from the pilot study were analysed through the prism of the Cronbach's Alpha method and showed reliability of 0.82, which is significantly higher than the 0.70 mark, therefore suggesting a profound internal reliability of the items. To claim construct validity, we used other items from the studies that had already been validated to adapt them to the Nigerian educational system. The combination of three methods, including surveys and interviews, provided some sort of validity of the methodology in this scenario.

The measures of validation confirmed that the instrument comprehensively captured the critical variables and validated that the instrument was robust enough to proceed with the full-scale study.

4. Result and discussion

Table 1: Respondents' Descriptive Responses on Digital Access and Economic Barriers (N=450)

Research Question	Response Category	Frequency (f)	Percentage (%)
RQ1: To what extent is household socioeconomic status	High-income household: full access	112	25%

associated with students' access to devise and internet?			
	Middle-income households: partial access	180	40%
	Low-income households: limited/no access	158	35%
RQ2: How do recurring digital costs (data, electricity) and device prices impact EdTech adoption?	High costs partially limit use	246	55%
	Moderate costs partially limit use	128	28%
	Cost do not affect use	76	17%
RQ3: What financing mechanism currently support or impede school readiness for digital learning?	Adequate school funding: supports EdTech	98	22%
	Limited funding: partial support	142	32%
	Poor/No funding: impedes adoption	210	46%
RQ4: Which policy interventions could reduce economic barriers to equitable EdTech adoption?	Subsidized device	200	44%
	Reduce internet/data pricing	154	34%
	Teacher training & infrastructure investment	96	21%

Notes:

- N = 450 respondents, including students, teachers, and school administrators.
- Data are aggregated from survey responses on a Likert-type scale and categorized for descriptive clarity.
- Percentages are rounded to the nearest whole number for simplicity

Table 2: Integrated Descriptive Analysis of Respondents' Views on Digital Access and Economic Barriers (N = 450)

Research Question	**Quantitative Findings (Frequency/Percentage)**	**Qualitative Themes (from Interviews)**	**Illustrative Quotes**
RQ1: Association between household socioeconomic status and students' access to device and internet	High-income households: 112 (25%) Middle-income households: 180 (40%) Low-income households: 158 (35%)	Theme 1: Economic Constraints as Primary Barrier	"Many students from low-income homes share devices or cannot afford data, which limits their participation in online classes". Teacher, Rural School
RQ2: Impact of recurring digital costs and device prices on EdTech adoption	High cost prevent use: 246 (55%) Moderate costs limit use: 128 (28%) Costs do not affect use: 76 (17%)	Theme 1: Economic Constraints as Primary Barrier	"Even when devices are available, students often stop using them because mobile data is too expensive". School Administrator, Rural Public School
RQ3: Role of school financial in readiness for digital learning	Adequate funding: 98 (22%) Limited funding: 142 (32%) Poor/No funding: 210 (46%)	Theme 2: Institutional Funding Gaps and Infrastructure Deficits	"Many schools have computers, but lack funds to maintain them or provide stable electricity for ICT classes". Administrator, Rural Public School
RQ4: Policy interventions to reduce economic barriers	Subsidized devices: 200 (44%) Reduced data pricing: 154 (34%) Teacher training & infrastructure investment: 96 (21%)	Theme 3: Unequal Digital Learning Opportunities	"Targeted subsides and better school ICT funding could help students from low-income families fully participate in digital learning". Teaching, Urban Private School

Key Points from Table:

1. Economic barriers device affordability, data costs, and school funding are consistently the largest constraints on digital access.
2. Qualitative themes directly complement quantitative findings, illustrating the lived experiences behind the numerical data.
3. Integration highlights policy priorities, such as device subsidies, reduced data costs, and infrastructure investment, to reduce socioeconomic inequalities in EdTech adoption.

Table 3: Hypothesis Test Results

Hypothesis	Statistical Test	Test Statistic	p-value	Result/Decision
H_1: Household socioeconomic status significantly influences students' access to devices and internet.	Pearson's correlation	r = 0.63	<0.001	Supported
H_2: Economic barriers (device cost, data cost, electricity, school funding) significantly predict EdTech adoption.	Multiple regression	F(4,445) = 39.27, R^2 = 0.47	<0.001	Supported
H_3: There is a significant difference in digital access between urban and rural schools.	Independent sample t-test	t(448) = 11.46	<0.001)	Supported
H_4: School funding levels significantly influence teachers' ability to integrate EdTech into classroom instruction.	Multiple regression (β coefficient)	β = 0.17	0.031	Supported

Notes:

- All hypotheses are tested at a 5% significant level ($\alpha = 0.05$).

4.1 Testing of Hypotheses

H_1: The socioeconomic status of students and teachers in the Nigerian educational system is a major determinant of their digital access.

The positive correlation and statistically significant difference of socioeconomic status and access to digital devices, the Internet, and e-learning tools is shown in the data, ($r = .63$, $p < .001$).

H_2: The absence of economic resources is a key predictor of the use of education technology in the educational system (cost of devices, cost of data, cost of electricity, and the availability of funds for the school).

The data from the regression model shows that the collaboration of economic resources was able to account for a significant portion of the variance of the use of educational technology ($R^2 = .47$, $p < .001$). The most significant predictors were cost of devices and cost of data.

H_3: School students who live in rural areas compared to school students who live in urban areas have significant digital access.

The results of the independent-samples t-test demonstrated that in the rural ($M = 2.21$) participants and urban ($M = 3.87$) participants, there was a statistically significant disparity in digital access and substantial geographic disparity, $t(448) = 11.46$, $p < .001$.

H_4: The amount of funding that schools receive greatly determines the extent to which teachers are able to use educational technology in their classroom teaching.

Regression results ($\beta = .17$, $p = .031$) and qualitative data (Theme 2: Funding Gaps) corroborated that better funded schools were more able to adopt digital learning technologies, whereas worse funded schools exhibit structural constraints.

4.2 Discussion of findings

The results show how digital inequities access across socioeconomic variables. From the data, only 38% of the low-income respondents' report having personal learning devices, while 82% of high-income respondents' report having personal learning devices. Likewise, 71% of the low-income students indicated that high data costs were substantive barriers to the frequent use of online learning.

Means prompted a comparison of the disparities existing within digital access of both low-income weighted at 2.14 on the digital access scale and the high-income access at 4.03 (SD = 0.71 and 0.88 respectively). Then the correlation test showed the existing of a digital access to educator technology use ($r = 0.58$) and a digital access to educational technology adoption correlation to digital access and. respectively) positively strong correlation ($r = 0.63$). Subsequently, multiple regression predictive modelling by the absence of financial means, educational technology adoption by educators and students,

could be determined barriers (F (4, 445) = 39.27, p). of digital access was identified 0.001, leaving a 0.47) school funding scale (F 4, 445) = 39.27, p 0.001, to concluded 0.47) strong devices (β 0.41, p 0.001) on Internet and data (β = 0, 36) low rates to electricity affordability (β = 0.14, p = 0.014) followed school funding to level forecasted a significantly weaker digital access school funding to (β = 0.031) Taking Complemented these were the qualitative research themes; 1. Primary Barriers, and 2. Institution Funding Gaps and Infrastructure and 3. Opportunities Unequal Digital Learning were identified. Instruction, and inconsistent financing and weak electricity supply were cited as barriers to teaching integrated assisted tech.

The results harmonize to show that education in Nigeria also suffers from inequity in socioeconomic factors that determine the degree and range of digitally-based education in the country.

These findings represent socio economic inequalities as the most important determinants of digital deprivation and use of educational technologies in the Nigerian context. Specifically, the quantitative data showed the socio economic status of the students to be the overriding factor in the ability to purchase a digital device, secure Internet connection or actively participate in online learning, all of which is in line with the Digital Divide Theory which states that access to digital devices is a function of availability of economic resources. The quantitative data also showed a fairly strong (r = .63) relationship between socio economic status and access to digital devices. This is also in line with the assertion made Azubuike et al. (2021), which states that wealthier households are more active and have higher digital participation. This was also supported by qualitative data, which showed that respondents mainly described economic constraints of various types as the most significant barrier to multi-session digital learning, which illustrates how the reduced availability of disposable income limits engagement in EdTech.

The regression analysis indicated that the most notable predictors of EdTech uptake were device affordability and data costs, illustrating the Technology Acceptance Model (TAM)'s contention that perceived usefulness is irrelevant if the technology is too expensive. This was also highlighted during the interviews. Teachers claimed that the availability of digital tools, but the inability to afford the necessary data costs to maintain connectivity, restricted continued digital usage. This is consistent with the Human Capital Theory. The restricted use of digital tools among low income learners is an inequitable and systemic barrier to the development of competencies that continue to compound inequitable deficits during the development of human capital.

Another dimension of digital inequities were the constraints at the institutional level. The analysis of the themes highlighted the gaps in institutional funding and infrastructure, particularly in public and rural schools. These findings support the national level reports, stating that inadequate funding for schools results in insufficient ICT labs, unreliable power supply, and poor technical support. The significant impact of school funding on the implementation of EdTech clearly illustrates the Capability Approach. Educational institutions need to have the necessary resources, and not just the tools to make digital pedagogy meaningful, to have the necessary capabilities. This is where the value of school funding is evident.

In the end, the findings show the geographic digital divide, where urban schools show considerably more access than rural schools, resulting from structural inequalities of broadband provision and public

spending, widening third-order educational outcome inequalities. The integrated approach reveals the extent of the influence of individual and household socioeconomic status, school resource availability, and overall regional infrastructure inequities on the digital access deficit in Nigeria.

In sum, the result of the study suggests that economic constraints at the household and institutional levels continue to bolster digital exclusion in education in Nigeria. The overall consequences are the limiting of EdTech opportunities to foster inclusive learning. This analysis points to the necessity of adopting bespoke policies as the provision of subsidized devices; reduced costs of data; better financing of schools; greater rural broadband infrastructure; and improved school financing.

5. Conclusion

This study affirms that socioeconomic status remains the most significant predictor of inequities with respect to access and use of educational technology in Nigeria. There is a gap on a number of digital learning opportunities related to access to the devices, the Internet, and the ability to use digital learning resources by students. The students' household income, the educational level of their parents, and the students' place of residence in rural or urban settings are the strong determinants of this learning gap. Particular economic constraints on affording devices, costs of data, and unreliable electricity are the most significant barriers, and, along with the inadequate funding of schools, limit teachers' ability to use EdTech. The use of both qualitative and quantitative data in this study make it imperative, however, that solutions that aim to digitalize education are carefully designed, or else, they will perpetuate and worsen inequities by failing to deliver opportunities for equitable learning.

Despite the contributions of this study, a number of limitations also exist. The samples chosen, even though participants came from three of Nigeria's states, may not fully encompass the true representation of some of the areas in the country and especially on the more isolated remote rural areas where extreme challenges with respect to digital connectivity are present. There is also the potential of reporting biases with respect to digital accessibility, household income, and the devices that they report to use, which relies on self-reported data that the study also considers. The study also focused on secondary schools, which further narrows the scope in terms of the application of the findings of the study to tertiary education and even informal learning settings. Finally, the cross-sectional nature of the design means that the study relies on data which may reflect a context that is rapidly changing in terms of policies, infrastructure, and even the income levels of households that have been observed after data collection.

The expansion of digital learning policies and broadband in Nigeria provides a unique opportunity for future research to consider longitudinal designs to determine how digital access and EdTech use change over time. There is potential to consider comparative research across multiple states and regions, and the inclusion of urban and rural areas would enhance understanding of potential regional differences. Use of advanced predictor models and AI to estimate effects of possible policy actions, such as subsidies for devices, reduced data costs, and increased teacher training, to close digital equity gaps would also be of interest. There is also a potential to study other formal educational levels and informally structured learning to further develop the understanding of the digitally inclusive learning environment in Nigeria.

5.1 Recommendations

The paper suggested the following recommendations:

1. Provision devices to subsidized Low-Income Students

Educational stakeholders and the state should seek to support subsidy schemes that provide free or low-cost laptops, tablets, and smartphones to students of low-income households. This would contribute to closing the first-level digital divide. Moreover, it would help provide all students the necessary equipment to participate in online or blended learning.

2. Decrease Internet and Data Costs

Educational data packages should be subsidized, and low-cost broadband should be made available. Effective collaboration between decision makers and telecommunication companies is vital. Reducing reoccurring digital expenses would enable sustained engagement with technological innovations in education, and would serve to minimize costs barriers identified in this research.

3. Increase Educational Investment to Improve ICT Infrastructure

Investment in functioning computer labs, stable electricity, and Internet connection is needed in schools in public, rural, and chronically underfunded areas. Enhanced institutional capacity would allow for the more efficient use of EdTech by educators, thus improving learning outcomes and supporting the Capability Approach framework presented in this work.

4. Professional Development and Training to Build Teacher Capacity

Educators should be provided with digital literacy improvement and technological pedagogical integration training. Teachers who possess these skills can use available resources to their maximum potential, thus addressing the second level digital divide, and ensuring that the use of digital tools fosters substantial learning.

5. Monitoring and Regulation of Digital Inequality

Policies to monitor the digital divide along socio-economic and geographical lines should be implemented by the government. Evidence-based monitoring can pinpoint areas of persistent exclusion to standard EdTech initiatives and facilitate the provision of these resources to low income students.

6. The promotion of Public-Private Partnerships (PPP)

The collaborations with private sector companies, NGOs and international organizations can assist in taking care of costs related to the devices, connectivity and training programs. PPP can use further resources, skills and ingenuity to add to the work the government does in proliferating digital equity.

7. The promotion of site based digital educational centres

In areas with insufficient home access, community educational centres that are set up with devices and Internet connectivity can offer shared digital learning experiences. Students in the poorer and the countryside areas will not be left behind in the digital transition.

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