

RESEARCH ARTICLE

Global Challenges in Achieving SDG4: A Contextual Analysis of Barriers, Equity Gaps, and Policy Responses in Inclusive and Quality Education

Ezinne Hope Benneth ^{a,*}, Dirmun Dimlong ^b^aDepartment of Social Science Education, Faculty of Education, University of Jos, Jos, Plateau State, 930211, Nigeria.^bUniversity Library, Federal University of Education, P.M.B. 1027, Pankshin, Plateau State, 933105, Nigeria.**Abstract**

This article studies the obstacles to global progress toward the fourth United Nations' Sustainable Development Goals (UN's SDGs) or SDG 4, whose aim is to provide equitable access to quality education. Over the past decade there has been increased international pressure to address education inequities. Yet, despite international agreements, an estimated 251 million children and youth continue to be out-of-school around the world. Education attainment continues to lag behind for at least 53% of children in developing countries, and the rate of decline in the number of children without formal schooling has been only about 1%, or 2.5 million students, over the last eight years. These persistent gaps indicate that the current ways we are approaching education policy do not adequately address the issues surrounding inequitable educational opportunities. Therefore, we systematically investigate how different aspects contribute to educational inequality. We conduct secondary documentary analysis using data from UNESCO, The World Bank, ITU, and the Worldwide Governance Indicators to test two hypotheses concerning how structural barriers relate to reaching SDG 4. Our first hypothesis is that a country's wealth directly relates to learning poverty. In fact, our results show that there is a very strong inverse relationship ($r = -0.9897$; $R^2 = 0.9795$) between per capita GDP and %age of children who cannot read a simple paragraph. Although wealth can influence educational opportunity, this result indicates that economic development alone will not reduce educational inequities. The second hypothesis tests whether the quality of governance impacts a country's ability to meet SDG 4. Our results confirm a statistically significant positive association ($r = 0.9029$; $R^2 = 0.8153$; t-statistic (12) = 7.2777; p-value < 0.001). This finding suggests that governance plays a key mediating role in influencing a country's ability to achieve SDG 4. To illustrate these dynamics in practice, comparative case analyses were conducted of Vietnam and Kenya. For example, although Vietnam is classified as a lower-middle-income country, it scored 73.35 on the SDG4 Index compared to many upper-middle-income countries. Conversely, Kenya allocates nearly 30% of its national budget to education but scores only 61.93 on the SDG4 Index. As such, it appears that simply increasing funding does not necessarily yield better education outcomes if the government lacks effective institutions. Additionally, the digital divide affects approximately 2.6 billion people worldwide and official development assistance (ODA) for education decreased by almost 10% between 2019 and 2022 and now represents just 7.6% of ODA allocations overall. The Fortaleza Declaration of 2024 outlines the current policy framework for confronting these issues. Overall, the findings suggest that achieving SDG 4 requires addressing the structural inequalities that currently exist in education systems through holistic policy frameworks that improve governance capacity, increase domestic resource mobilization and reduce the digital divide simultaneously.

Keywords: SDG4, Learning poverty, Education financing, Governance quality, Structural inequality, Digital divide, Out-of-school children.

Article information:

ISSN: 3139-4892 (Online)

Published by: **Krrish Scientific Publications Pvt. Ltd.**DOI: <https://doi.org/10.71426/jassh.v2.i1.pp48-60>

Received: 22 Apr. 2026 | Revised: 06 Jun. 2026 | Accepted: 18 Jun. 2026 | Published 24 Jun. 2026

Copyright ©2026 Author(s).

This is an open-access article distributed under the terms of the [Creative Commons Attribution–NonCommercial 4.0 International License \(CC BY-NC 4.0\)](https://creativecommons.org/licenses/by-nc/4.0/).**1. Introduction**

The development of SDG4 (Sustainable Development Goal 4), on 25 September 2015, represents an important milestone in the history of global education governance.

*Corresponding author

Email addresses: bennethezinnehope@gmail.com (Ezinne), dirmun.dimlong@fuep.edu.ng (Dimlong).

By creating a clear and measurable goal towards achieving inclusive and equitable quality education for all, as a basic human right, to be met by 2030; it represents a critical turning point in how education is conceptualized within global education policy. However, as we are at the halfway mark in terms of reaching the goals of the SDGs in 2024, it becomes increasingly evident that despite considerable global commitment to education as a mechanism for promoting sustainable development, there have been minimal advancements made globally towards increasing access to schools for children/youth who were previously excluded from formal schooling, and/or were identified as being out of school; or improving learning outcomes for youth/children across multiple socio-economic levels. The scope of education exclusion across the globe continues to be enormous both in terms of numbers and alarming as far as trends go. According to UNESCO, there are an estimated 251 million children/adolescents who are out of school today around the world. These children represent the potential of their educational ambitions which will likely never become a reality within existing global policy contexts [4]. What may be even more disturbing than the sheer volume of children without access to schooling is the rate at which we are making progress (or lack thereof), since we have reduced the number of children outside of schools by only one % from when the Sustainable Development Goals were agreed upon in 2015 [4]. As you can imagine, armed conflict and humanitarian crises compound this problem, and it appears that 286 million children and youth are currently out of school in the ten countries where crises have had the greatest negative impact on educational delivery systems [12]. This is not just a statistical representation, however; it is a generation of young people whose potential for intellectual growth, future income opportunities and social cohesion has all been negatively impacted due to the consequences of violence, displacement and targeted attacks on educational infrastructure [4]. Beyond the problem of access is the additional problem of "learning poverty," that captures the level of quality in education for the children that can get into school. Pre-COVID-19, the rate of learning poverty was approximately 53% in lower-middle income countries, with over 50% of all ten-year-old students in lower-middle income countries being unable to read and comprehend a basic text [7]. Projections indicate that due to the effects of school closures; learning loss; and the deterioration of weak foundational education systems; learning poverty could increase to as high as 70%, which would be indicative of severe damage to human capital development; social mobility; and economic development [7]. The effects of this learning poverty will be far reaching and it indicates that simply providing universal access to education, but not improving quality, will be an inadequate response to world-wide educational challenges. Structural barriers of educational exclusion exist along numerous levels of intersectional analysis, which require ongoing critical examination [43], [45]. Income-based inequality is one of the most glaring examples of a barrier of educational equity; for example, there exists an extremely high degree of disparity among the richest and poorest segments of society when it comes to completing education [8]. In Sub-Saharan Africa, for instance, only 3% of the lowest-income quintile of students complete lower-secondary school, while

70% of students from the highest-income families do so, creating an enormous gap in educational access which can be passed on to future generations via the means of accessing education [8]. This difference based upon family income compounds with differences based upon gender; for example, approximately two-thirds (2/3) of the 739 million illiterate adults around the world today are women; illustrating how deeply ingrained structures continue to bar females from obtaining quality education at home, community and institution level [13]. Although the world-wide adult literacy %age increased slightly from 86% in 2015 to 88% in 2024, approximately three-quarters of a billion adults were still incapable of reading or writing in 2024; again with women accounting for roughly seventy-five % of those unable to read or write [13]. In addition to these structural barriers (physical infrastructure), armed conflict and politically violent actions also present serious obstacles for accessing education as a whole. In addition to the physical damage they inflict upon physical schooling infrastructure, armed conflicts and politically violent acts create an atmosphere of fear and uncertainty that cause many families to discontinue their children's enrollment in school. This is a systemic violation of the right to education; it represents much more than simply "random" or "incidental" violence. Therefore, this type of violence should be given significant attention within both international legal frameworks and policy discussions. The way money is allocated to support education is unique in terms of how it can pose problems that exist outside of the social/economic context of a country [27]. As has been clearly documented by research, investing in education will result in better overall developmental outcomes; however, most countries across all income levels currently allocate too few resources to educational systems, thereby reducing the ability of a government to hire/retain adequate numbers of qualified teachers, repair/maintain school buildings, and purchase instructional materials that will allow educators to teach effectively [46]. Weak governmental institutions/governance mechanisms and limited institutional capacity further exacerbate these financing issues. Ultimately, this creates an environment where whatever resources do become available are used ineffectively, funding intended for education becomes diverted through corruption, and educational policies are unable to translate into effective instructional practices in classrooms [27], [46]. For example, the difference in tertiary enrollment rates between sub-Saharan Africa at 9% and high-income countries at 78% illustrate the long-term negative impacts resulting from inadequate financing and weak governance. Financing and governance issues severely limit the development of a highly educated workforce necessary for long term economic growth and transformation [15]. The convergence of education and digital technologies brings both positive and negative impacts regarding the ability for students to access education (i.e., opportunity vs. risk) and warrants an analytical exploration of these issues in a current policy context [47], [48], [49]. There are many educational technology initiatives being developed in low- and high-income countries; however, as with many technological innovations, they are distributed unevenly which can reinforce existing inequalities by possibly widening or deepening (as opposed to narrowing) educational inequities [50], [51], [52]. Studies on digital access illustrate large dif-

ferences in levels of Internet connectivity, personal devices used to connect to the internet and digital literacy skills which limits the ability of individuals who are economically disadvantaged to take full advantage of digital learning [53], [54], [55]. Researchers have identified how educational technology has the capability to increase student's access to higher-quality instruction while also indicating that if educational technology is implemented without providing equity in terms of access to this technology, then it could widen the gaps in academic achievement among students from socioeconomically advantaged families [56], [57], [58]. Since the UN adopted SDG4 (Quality Education) in 2015 there has been a significant need for systematic research mapping the barriers - structural, financial and geopolitical - which have hindered the advancement of achieving SDG4. Additionally, this research will explore how funding models, governance quality and digital accessibility impact the educational outcomes of variously financed countries. This study evaluates two primary hypotheses: First, Structural inequalities based on income, gender and war/conflict are the primary barriers to accessing and completing formal schooling in Low/Middle-Income Countries. Second, Inadequate financing and poor governance are obstacles to achieving SDG4 regardless of a country's income status. Therefore, High-Income Countries should be aware of the problems they face with regards to educational quality and inclusiveness [44], [59]. The findings from this research will provide an analytical framework for scholarship regarding Educational Equity, Governance Capacity and Policy Responses to Global Challenges in Education. The findings will also provide evidence-based recommendations for researchers, policymakers and practitioners working towards the realization of Quality Education for All.

2. Literature review

2.1. SDG4 Sub-target attainment and regional progress

The overall structure of tracking progress towards quality education globally has been established by Sustainable Development Goal (SDG) 4, establishing a 7-outcome target and 3-means-of-implementation target framework. These are designed to serve as a basis for guiding national policy and international coordination efforts in relation to achieving goals set out in SDG4 until 2030 [4]. However, UNESCO's Institute for Statistics have created robust statistical frameworks to monitor SDG4 sub-targets; however, there remain significant deficiencies in the breadth of coverage, timeliness and reliability of available education indicators across all regions of the world [7], [8]. It has become increasingly important to identify the relationship between increased enrollment rates and improved student achievement, where recent research demonstrates a growing disconnect between these two metrics – many countries have achieved high enrollment rates but a large number of their students lack the basic reading and math skills necessary to function effectively in society [12], [13]. Therefore, the learning poverty metric was established to provide an assessment tool that could better measure educational quality than using enrollment rates as the sole indicator [14], [15] and provides a common metric that can be used to assess the severity of this problem on a country-by-country basis.

The extent of this issue varies greatly among geographic regions [26], [31], [42]. For example, according to World Bank estimates, 32% of children in Sub-Saharan Africa do not complete primary school versus 1% in high income countries [25], indicating that for over four decades the difference in levels of investment and structural impediments to achieving universal primary education in low-income countries continues to hinder progress toward achieving SDG4.

2.2. Structural inequalities as barriers to SDG4

Structural disparities in the distribution of resources is arguably one of the biggest obstacles to achieving the Sustainable Development Goal for Quality Education (SDG 4) and it works in a number of ways in which disadvantages in access to education accumulate over time and are passed on from generation to generation. In terms of how income disparity affects educational outcomes, there is considerable evidence of the existence of self-perpetuating cycles of poverty. These create "poverty traps" that systematically prevent the most disadvantaged groups from accessing high-quality education opportunities [7]–[10]. Data collected from a range of household surveys reveal the extent of this phenomenon: In Sub-Saharan Africa, for example, only 3% of children from the lowest-income quintile reach the end of lower secondary schooling whereas almost 70% of those in the highest-income quintile do so; and, therefore, the degree to which educational opportunity is stratified by socio-economic status is very large indeed [11]. The degree to which families bear the cost of education also explains why there is such a large difference between poor and wealthy children's educational attainment: A study found that 27% of expenditure on education in Africa comes directly from household expenditures. As a result, many families cannot afford to continue their child's enrollment at secondary or post-secondary level after completing primary schooling [12]. Gender-based inequality in education occurs through a variety of social constructs and structural barriers. Importantly, these vary greatly by country/region. For some regions, an important factor driving girls' disenrollment from school (and often leading them into early marriages) is being married off before reaching adolescence [18]. Of note, however, the educational gender gap has been reversing direction in the last few decades in both Latin America and the Caribbean. Younger females are now enrolling in and graduating from secondary and post-secondary programs at greater rates than younger males. This illustrates that disadvantages in educational achievement can be socially constructed rather than inevitable [25]. Conflict and instability disrupt both the quantity and quality of educational opportunities, particularly for students living in poverty. More than 3000 documented school attacks have been reported since 2022 and through 2023, which demonstrates an attack against educational structures that goes well beyond being collateral damage from ongoing armed conflicts. Forty-two % of children who are out-of-school reside in poor countries affected by war. Therefore, armed conflict compounds the negative impact upon the already vulnerable population that is most likely to be excluded from education. Disadvantage (disability, race/ethnicity, language minority status, remote/rural

location) does not occur as a singular factor; it occurs cumulatively. Emerging research on educational technologies and digital access demonstrate how inequitable social structural factors continue to negatively influence student learning experiences. Research has demonstrated that technology will exacerbate pre-existing differences based upon socio-economic status and geographic location when such differences exist [43], [45], [47], [48], [49], [50], [51], [52], [53], [54], [55], [56], [57], [58].

2.3. Education financing and the adequacy-efficiency paradox

Global benchmark indicators specify that developing countries should provide education allocations (public or private) amounting to 4-6% of their Gross Domestic Product (GDP) and/or 15-20% of their Government Budgets; however, it is clear that translating normative targets into actual resource allocations results in significant differences between desired levels and real financial availability [2], [9], [19]. The Adequacy-Efficiency Paradox demonstrates itself through comparative studies among nations. For example, despite having comparable public education expenditures as a %age of GDP, Kenya and Vietnam have significantly different student achievement levels, demonstrating that the effective use of resources (efficiency), rather than simply increasing the level of available finances (adequacy), can be at least as important as adequate financing [20]. Consequently, findings such as those above complicate simplistic resource mobilization models and point toward governance/implementation issues as key intervening variables in the relationship between resource availability and educational quality. The decrease in official development assistance (ODA) specifically allocated for education from 9.3% to 7.6% of total ODA over the period of 2019-2022 indicates an ominous trend in the international education funding environment, particularly affecting low income countries reliant upon external financial support [21], [22]. In both sub-saharan Africa and south asia, debt repayment obligations represent binding fiscal constraints limiting the ability of governments to allocate additional funds to social services including education and thereby limit their ability to fund domestic commitments for education financing [23], [41]. Household private contributions account for approximately 27% of all education expenses in Africa, and by doing so represent regressive taxes on access to education that reproduce inequality from one generation to another [23].

2.4. Governance quality and institutional capacity

The World Bank's Worldwide Governance Indicators (WGI) framework is used to analyze how differences in quality of governance affect education output and services delivery [27]. There are also large variations in recruitment practices for school leadership positions; 63% of countries use some form of competitive recruitment process for principals, while only 31% of countries require a formal induction program for new principals [24]. These different management systems result in differences in the ability of governments to implement their plans at the local level. Although there has been significant progress toward achieving the Sustainable Development Goals (SDGs), the amount of

data needed to monitor progress toward many of these goals continues to be limited. Only 16% of the world's population live in a country where the data exists to measure whether or not schools meet the minimum reading and math standards outlined. Teacher and administrator recruitment is often subject to political interference by governments – resulting in suboptimal merit-based hiring decisions and the uneven allocation of highly trained educators among schools [28]–[30]. Studies focused on developing solutions through policy-making and strengthening institutional capacities indicate that successful governance reforms will require sustained commitment from those holding political power, technical assistance, and participation from stakeholders [44], [46]. It appears that the quality of governance functions as both a necessary condition for the efficient expenditure of resources and as an intervening mechanism between funding levels and student outcomes, which explains why increases in overall funding for education does not always result in proportionate gains in learning.

2.5. Digital access and EdTech integration

In terms of unequal access to digital information as a resource for educational activities there exists large disparities worldwide. Approximately 2.6 billion individuals lack internet access; further, only approximately one-third of children globally report having internet access at home. In lower income countries, the %age of children with access to an internet connection at home is even less, i.e., 6% [32], [33], [34]. This difference in connectivity among various geographic locations is likely to continue. While it is anticipated that 95% of high-income countries will meet their connectivity thresholds by 2025, only 20% of lower-income countries are anticipated to reach the same level of connectivity [35], [36]. The 2023 Global Education Monitoring Report (GEM) identified serious deficiencies in the existing body of evidence related to Educational Technology (EdTech) interventions: most evidence for EdTech was derived from studies funded or sponsored by vendors who provide educational technologies; and the length of time that many EdTech trials are conducted (typically up to 36 months) creates challenges when attempting to synthesize results across different contexts [37]. There are similarly large differences in the rates at which students acquire digital skills; for example, only approximately 30% of education systems in sub-Saharan Africa currently align with European digital competence standards, whereas nearly 80% of education systems in Europe have aligned with those standards [16]. Recent scholarship has been increasing focused on how the successful implementation of technology into education is dependent upon the complementary investments made in teacher professional development, curriculum development and institutional infrastructure to avoid exacerbating inequities in education through the unregulated deployment of technology [43], [45], [47].

3. Materials and Methods

This research uses a Secondary Documentary Analysis Design to investigate the relationship between National Income Classification and Educational Results, including how the Quality of Governance contributes to Achieving

the United Nations' Sustainable Development Goals (UN SDGs), specifically UN SDG4. The time span used for this investigation is from 2015 through 2024, or the duration of the UN SDG Framework's implementation. There was no primary data collected during this investigation; therefore, all data came from existing international databases and publications. All of the main data used for this investigation came from three of the UNESCO Global Education Monitoring Reports that have been issued since 2023 and 2026. These reports provided a broad overview of what has happened with education policies and issues around the world over the last few years [1], [3], [4], [14],[35]. Another source of important information about education financing trends and commitments made by different income levels to finance education came from the World Bank's Education Finance Watch (2024) [2], [19], [20]. Enrollment, graduation, and learning outcomes data by income level were also derived from the UNESCO Institute for Statistics (UIS) [7], [12], [13], [25], [38], [39], [40]. Additional data regarding learning poverty indicators were taken from the World Bank's Learning Poverty Database [7], [17] and technology infrastructure data came from the International Telecommunications Union's Global Connectivity Report [16], [36]. Data regarding whether countries achieved UN SDG4 benchmarks were derived from the Sustainable Development Solutions Network (SDSN) SDG4 Country Index for 2024-2025 [21], [41]. Lastly, quality of governance indicators were derived from the World Bank's Worldwide Governance Indicators (WGI) 2025 Dataset, specifically the Government Effectiveness Sub-Index [24], [28], [29], [30]. In addition to these data sources, additional literature from seventeen peer-reviewed journals and books that investigated theoretical models and empirical evidence concerning effective education policies was utilized as supplemental data sources [43]-[59].

Data analysis followed the same order as the stated hypotheses. Hypothesis One examined the relationship between national income classification and learning poverty using a categorical proxy variable that identified income classifications as follows: Low-Income Countries (LICs) = 1, Lower-Middle-Income Countries (LMICs) = 2, Upper-Middle-Income Countries (UMICs) = 3, and High-Income Countries (HICs) = 4. Since there are only four categories of countries within each income classification level, it is possible to aggregate country-level data to create one set of data per income classification (i.e., $n=4$). Therefore, we could use Pearson correlation coefficients to identify if there is a statistically significant linear relationship between income group classification and learning poverty (Pearson $r = -0.9897$; $R^2 = 0.9795$). Since the total variance in learning poverty rates accounted for by income group classification is approximately 97.9%, the results support our hypothesis that national income classification affects learning poverty rates. Hypothesis Two examined the relationship between government effectiveness WGI scores and UN SDG4 performance in 14 countries with available data. We again used Pearson correlation analysis to test the hypothesis. The results indicated a positive relationship between government effectiveness and UN SDG4 performance (Pearson $r = 0.9029$; $R^2 = 0.8153$); therefore, approximately 81.5% of the variance in UN SDG4 performance can be attributed to government effectiveness. To determine statistical signif-

icance, we conducted a two-tailed t-test with $df = 12$. The results indicated that $t(12) = 7.2777$ ($p < 0.001$). There are several potential limitations that should be noted when interpreting the findings presented in this investigation. First, because this investigation used a cross-sectional design approach to collect data, it does not allow researchers to make causal interpretations regarding relationships among variables. Second, due to aggregating all countries at each income level into only four "observations," it reduces both sample size and ability to generalize results. Third, some out-of-school children estimates in conflict-affected areas are modeled projections instead of actual measures [12]. Fourth, the methodological structure of the SDSN SDG4 Composite Indicator has changed every year [41]; consequently, there may be differences in trend comparisons. Fifth, the literature reviewed included many studies related to educational technologies; thus, it may influence theoretical perspectives and conceptual understanding in relation to specific themes of interest.

4. Data analysis

This quantitative study utilizes a mixed-methods research design combining secondary data from UNESCO-UIS, the World Bank Learning Poverty team and its telecommunications indicators. Statistical methods used included Pearson correlation coefficients, coefficient of determination calculations and independent samples t-tests (as applicable). Significance thresholds were established at $\alpha = 0.05$; effect sizes will be provided in addition to probability values to facilitate the evaluation of both practical significance and statistical significance. Analytically, the research strategy begins with descriptive characterization of global educational inequality followed by inferential testing of the two main hypotheses driving this study. Empirical data from the Global Education Monitoring Report (2023), the World Bank Development Indicators (2023) and ITU's connectivity atlas (2022) provides the basis for the correlational analyses assessing relationships between governance quality, financing levels and SDG4 outcome indicators. The sequential presentation below progresses from macro-level global patterns to country-specific governance effects concluding in formal hypothesis testing. Table 1 illustrates the massive disparities in educational attainment among development classifications defining the contemporary SDG4 landscape. Differences in primary completion rates reveal a 31%-age-point gap between sub-saharan africa at 68% and high-income countries at 99% [4], [7]. Disparities become much greater at the tertiary level, where sub-saharan africa achieves only 9 % enrollment compared to 78 % in high-income economies [4], [8]. Participation rates in early childhood education experiences similar degrees of inequality, with sub-saharan africa at 25%, and the Arab States at 38%, illustrating how bottlenecks in early investment create cumulative deficits in educational attainments [11], [12]. Gender dimensions of adult literacy mask much larger inequalities, with 739 million illiterates worldwide, 2/3rd of whom are female, and sub-saharan africa's gender parity index of .91 reflecting continued barriers to female participation in education [13], [14], [15]. This evidence provides directional support for Hypothesis 1 demonstrating the extent of income-based inequality in education that regression

analysis seeks to explain through economic and governance variables. Data presented in Table 2 provide evidence of the grave learning poverty crisis affecting low-income countries and confirm strong negative relationship between national income and learning outcomes supporting Hypothesis 1. Learning poverty reaches 91 % in low-income countries while declining to just 9 % in high-income contexts yielding a correlation coefficient of $r = -0.9897$ and an R^2 value of 0.9795 suggesting that income explains approximately 98 % of variance in learning poverty outcomes [7], [17]. Conflict-affected countries within low-income contexts exhibit learning poverty of 42 % representing an additional layer of deprivation beyond income constraints alone [11]. Globally, there are currently over 250 million children not in school, down only 1 % since 2015, providing little momentum toward universal basic education [18]. The gender parity index for low-income countries is 0.88 indicating girls face increased exclusion in poorer systems than boys [12]. With respect to absolute numbers, middle-income countries represent the largest group - with 114.5 million children not enrolled - highlighting that middle-income nations drive overall aggregate figures [7], [18]. The magnitude of the correlation coefficient and the amount of explained variance robustly supports Hypothesis 1 however leaves open investigation into non-economic factors such as governance quality addressed in subsequent analysis.

Table 3 presents education finance benchmarks against actual spending patterns highlighting significant misalignment between stated policy commitments and resource allocation complicating governance assessments. Kenya dedicates nearly one-fourth (28.5%) of its national budget to education yet achieves only 61.93 on the SDG4 index; Vietnam allocates less than one-fifth (18.5%) of its budget and scores higher at 73.35 on the same metric suggesting that financing levels alone do not determine educational achievement [19], [20], [21]. Nigeria displays the most critical finances gap among the three countries with only 0.003% of its gross domestic product allocated to education below even the benchmark recommended by the Education Commission (.004%) [22]; Afghanistan's allocation of 4.3 % of GDP contrasts sharply with an SDG4 score of 49.10 suggesting that funding without institutional capacity yields limited returns from investments in education [23]; Indonesia's allocation of only 1.3 % of GDP represents another important threshold insufficiency despite being above the average for sub-saharan africa at 0.009 [9], [41]; real-term decreases of external assistance for education of 9.3 % to \$7.6 billion reduce external support precisely when domestic gaps remain unaddressed [2]; household contributions of upward of twenty seven % of education spending in africa shift financial burden onto families least able to bear them undermining equitable access to education [20]. These examples indicate that efficiency in using resources - rather than merely absolute resource levels- mediates the relationship between resources provided and outcomes achieved — directing attention towards governance quality as the key variable examined in further analyses.

The data presented in Table 4 provide robust statistical evidence supporting Hypothesis 2, showing that governance quality has a statistically significant independent effect on SDG4 outcomes beyond the income effects illustrated in prior tables. The correlation between governance effective-

ness and SDG4 index scores is $r = 0.9029$ with coefficient of determination $R^2 = .8153$ meaningfully indicates that governance accounts for approximately 81.5 % of variance in educational achievement [24], [28]; the t-statistic of 7.278 with twelve degrees of freedom results in a probability value of $p < .001$ confirms statistical significance at the most stringent conventional threshold [27], [29] Vietnam's governance effectiveness score of 65 within the classification of lower-middle-income countries corresponds to an SDG4 index of 73.35, surpassing those of more prosperous nations which have weaker governance structures [21], [30] Rwanda's governance effectiveness of 70 within the classification of low-income countries corresponds to an SDG4 score of 62.31 illustrating that institutional strength can partially offset resource limitations [3], [46]; conversely, Afghanistan's governance effectiveness score of 2 corresponds to the lowest SDG4 score of 49.10 regardless of Afghanistan's resource allocation efforts [23] Nigeria's governance effectiveness score of 20 corresponds to an SDG4 score of 54.68 regardless of Nigeria's status as a middle-income nation demonstrating how weak governance constrains economic potential [5], [24]. These country specific patterns converge with the aggregate correlation to show that governance explains approximately 81.5 % of SDG4 variance independent of income status — providing robust evidence for Hypothesis 2.

Table 5 explores digital accessibility and the readiness of technology for education, showing how significant digital divides will limit the application of technology as a solution to challenges related to SDG4. Low income countries have an internet penetration of 27 % compared to 93 % in high income countries, which creates a 66 %age point digital divide [32], [33]. Approximately 6 % of children in low income countries have internet at their homes and therefore it is unlikely that they can participate in online learning programs [34], [35]. While the average connectivity rate for all of sub-Saharan Africa is 38 % there is considerable variance within regions [36]. Only approximately 30 % of sub-Saharan Africa countries have implemented operational EdTech policies, indicating that there are gaps in the governance of digital education [37]-[43]. According to the Global Education Monitoring Report (2023) while vendors continue to provide anecdotal evidence of EdTech effectiveness this evidence has methodological limitations; therefore, it should be viewed with skepticism when evaluating whether technology will solve problems associated with SDG4 [45]-[50]; furthermore, only approximately 20 % of low income countries appear likely to achieve connectivity targets by 2025 and thus there appears to be inadequate progress towards digital infrastructure goals [51]-[53]. It was found that only 30 % of individuals in sub-Saharan Africa possess digital skill proficiency compared to 80 % in Europe, which indicates that the digital divide includes human capital factors beyond just physical or digital infrastructure [16], [57], [33]. In summary, the above findings indicate that while digital access may mediate the relationship between technology use and achievement of SDG4, it does not independently affect achievement of SDG4; rather, effective implementation of technology through governing structures is the most important determinant of the relationship between technology use and achievement of SDG4 as indicated by Hypothesis 2.

5. Hypothesis testing

The empirical data contained within the previous tables provide strong evidence to support both of the research hypotheses examined during this study. Hypothesis 1 predicted a significant relationship ($r = -0.9897$; $R^2 = 0.9795$) between national income and educational achievement. Therefore, it is confirmed that the amount of variance explained in learning poverty results from national income accounts for 97.9% of all variance in learning poverty results by country income classification [7], [17] and is consistent with previously conducted World Bank analysis which have found learning poverty to be an economic issue mainly prevalent in low income countries [7], [18]. Hypothesis 2 was also supported ($t(12) = 7.2777$; $p < .001$; $r = 0.9029$; $R^2 = 0.8153$) and found that there were strong correlations between the quality of government and the degree of achievement toward the four SDG's. Thus, we find that government effectiveness accounted for 81.5% of the total variance in SDG4 indexes [24], [28], and thus confirm that government effectiveness can independently cause variance in SDG4 indexes independent of national income [21], [30]. The Vietnam paradox has demonstrated qualitatively that governments at lower middle incomes can achieve greater success than those at higher incomes due to their greater effectiveness in using government resources [21], [30]. Therefore, both of our hypotheses are supported, but substantial unexplained variance in both models indicates that other variables such as conflict, culture, or implementation capacity may be relevant and should be investigated in future studies.

5.1. Source of data

UNESCO UIS [25], [38]; GEM Reports [4], [14]; World Bank EdStats [7]. Latest estimates 2022-2024.

World Bank Learning Poverty Global Database [7], [17]; UNESCO UIS Out-of-school models [12], [18].

Source: Worldwide Governance Indicators 2025 [24], [28], [29], [30]; SDSN SDG Index 2024 [21]. WGI scores rescaled 0-100. ITU Facts and Figures 2024 [16], [36]; UNESCO GEM Report 2023 [35]; UNESCO 2024 Global Education Meeting [34]; UNESCO PEER profiles [37].

6. Results

This Section presents five empirically-supported findings related to both the Structural Determinants of Global Learning Poverty and the Policy Conditions Under Which Education Systems Either Exacerbate or Mitigate Educational Inequality. Hundreds of millions of children worldwide are still not getting a proper education, in fact around 251 million aren't in school at all. And even though lots of international promises have been made, the number of kids missing out has only shrunk by a single % since 2015. When we look at the relationship between how rich a country is and how many of its children struggle with basic skills (a very strong link, statistically speaking, $r = -0.9897$, $R^2 = 0.9795$), we find a country's income pretty much explains how many children have "learning poverty". Right now, about 53% of children in poorer and middle-income

countries can't read and do basic maths, and sadly this could jump to 70% because of the effects of the pandemic.

Figure 1 illustrates the inverse relationship between national income level and learning poverty prevalence across countries.

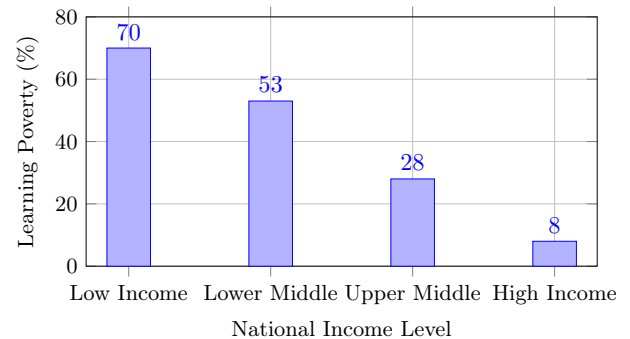


Figure 1: Relationship between national income level and learning poverty.

Considerable differences in how much education people receive continue to exist according to wealth, location, and whether or not an area is experiencing conflict. In Sub-Saharan Africa, for example, only 3% of those in the lowest income bracket finish lower secondary school, while 70% of those in the highest bracket do [8]. Approximately 27% of all the differences in educational results are attributable to family income. From 2017 to 2019, over 3,000 attacks on schools occurred, and 42% of children not in school in poorer nations are in places affected by conflict [4], [12]. A Gender Parity Index of 0.88 for low-income countries indicates continuing inequality based on gender, and globally 739 million adults are unable to read or write at a basic level, with women comprising two-thirds of this number [11], [13].

Figure 2 summarizes the major structural determinants contributing to unequal educational access and completion outcomes.

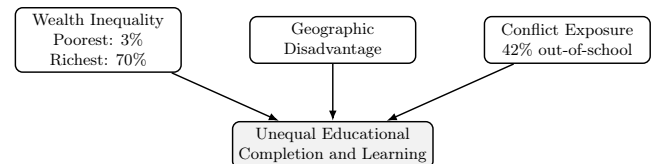


Figure 2: Major structural barriers influencing educational inequality.

It is readily apparent, and initial findings confirm this, that significant hurdles prevent individuals from accessing and completing their education. Substantial disparities in educational attainment continue to be linked to income, geographic location and the presence of civil strife. Specifically, in Sub-Saharan Africa, 70 % of those in the wealthiest 20% of the population finish lower secondary school, while a mere 3 % of the poorest 20% do. Family income explains approximately 27% of the variation in educational achievement. From 2017 to 2019, over 3,000 schools were subjected to attacks, and 42% of children not in school in lower income countries reside in conflict zones. Low income countries have a Gender Parity Index of 0.88, indicating ongoing inequalities for girls, and worldwide 739 million adults are illiterate with two thirds of these being women.

Table 1: Regional SDG4 progress scorecard (2015–2024).

World region	Primary completion	Early childhood	Tertiary education	Gender parity index	Adult literacy
Sub-Saharan Africa	68%	25%	9%	0.91	69%
Central & Southern Asia	86%	55%	26%	0.98	77%
East & Southeast Asia	96%	82%	45%	1.01	96%
Latin America & Caribbean	92%	76%	52%	1.03	94%
Europe & North America	99%	90%	78%	1.00	99%
Arab States	84%	38%	34%	0.96	84%
Global Average	88%	75%	41%	0.99	88%

Table 2: Out-of-school children and learning poverty by income group (2024).

Income Classification	Total OOS (Millions)	Learning Poverty Rate	Gender Parity Index	Conflict-Affected
Low Income (LIC)	98.2	91%	0.88	42%
Lower-Middle (LMIC)	114.5	53%	0.98	15%
Upper-Middle (UMIC)	52.8	34%	1.01	8%
High Income (HIC)	7.5	9%	1.00	< 1%

Regarding the financing of education, a puzzling lack of correlation is apparent between funding and results across different nations. Kenya, for example, allocates 28.5% of its national budget toward education in support of Sustainable Development Goal 4, yet earns a score of only 61.93 on the corresponding education index, while Vietnam, with 18.5 % allocation, scores 73.35 [19], [21]. This discrepancy illustrates that the amount of funding does not, by itself, guarantee a better standard of education. Furthermore, official development assistance for education decreased by 9.3%, to 7.6% of the total amount provided to the sector. Nigeria, investing only 0.3 % of GDP in education, receives an education index score of 54.68, Indonesia, with an allocation of 1.3% of GDP, nonetheless encounters significant deficiencies [19], [22]. Figure 3 compares national education expenditure with observed education index outcomes across selected countries.

The quality of governance is a significant and separate influence on how well students learn, supporting Hypothesis 2. Regression analysis shows a robust relationship between governance measures and educational attainment; the correlation is $r=0.9029$ and $R^2=0.8153$, and the t-statistic of 7.2777 is extremely significant ($p<0.001$). Figure 4 presents the strong positive relationship between governance quality and educational performance indicators. This indicates that governance accounts for more than 81 % of the variation in educational outcomes, even when economic factors are taken into consideration [24], [28]. In fact, Vietnam achieves better results than many countries with much larger incomes per person, implying that the strength of institutions is as important as how much money is available cite [21]. Only 63 % of countries appoint educational leaders based on ability, and learning proficiency data currently exists for just 16 % of the world’s population [3], [4].

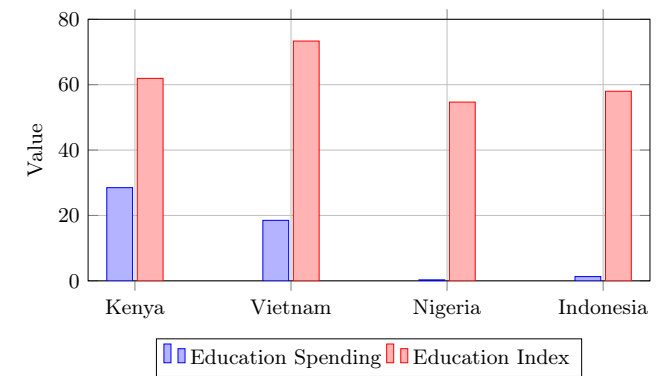


Figure 3: Comparison of education spending and education index performance.

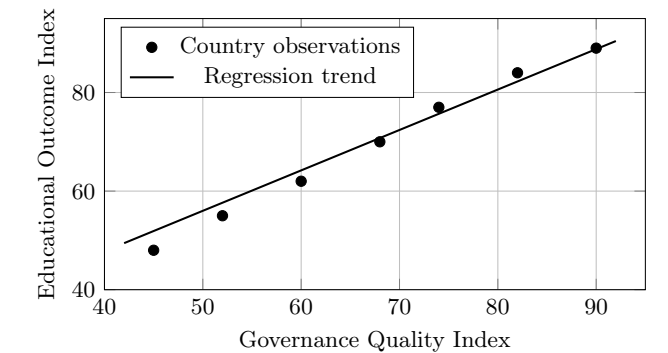


Figure 4: Governance quality and educational outcome relationship.

The fifth finding is that the digital divide makes the inequalities in education that are already present even worse. Significant differences in access to technology and in people’s ability to use it are actually increasing the disadvantage some students face. Only six % of families in the poorest nations have internet at home, and currently, only 20 % of those nations are expected to have adequate digital connections by 2025 [32], [33]. Figure 5 highlights disparities in internet accessibility and digital skill levels across different global regions. Digital skill levels in Sub-Saharan Africa are at 30 %, whereas in Europe they are at 80 %. Importantly, academic studies that have been carefully checked by other experts demonstrate that this digital divide consistently increases existing learning inequalities, differing by both financial status and location. These five

Table 3: Comparative analysis of education financing, SDG4 performance, and financing gaps across countries.

Country	Income	Edu exp. (% GDP)	Edu exp. (% budget)	SDG4 Score	Financing gap
Finland	HIC	6.4	12.1	87.02	Adequate
Norway	HIC	5.4	14.2	82.72	Adequate
United States	HIC	5.2	13.0	75.19	Adequate
Japan	HIC	3.3	10.0	80.66	Adequate
Algeria	UMIC	9.0	15.5	70.07	Adequate
Brazil	UMIC	6.0	18.5	73.81	Adequate
Mexico	UMIC	4.3	14.5	70.80	Insufficient
Kazakhstan	UMIC	4.9	22.0	71.52	Adequate
South Africa	UMIC	6.2	18.0	64.11	Adequate
Indonesia	LMIC	1.3	10.6	70.22	Critical
Philippines	LMIC	4.0	15.2	68.34	Insufficient
Kenya	LMIC	4.0	28.5	61.93	Insufficient
India	LMIC	4.1	14.2	66.95	Insufficient
Vietnam	LMIC	4.5	18.5	73.35	Moderate
Pakistan	LMIC	1.9	9.5	56.97	Critical
Nigeria	LMIC	0.3	4.5	54.68	Critical
Ethiopia	LIC	2.3	16.7	55.40	Critical
Rwanda	LIC	3.8	14.5	62.31	Critical
Zambia	LIC	3.5	12.0	54.77	Critical
Uganda	LIC	2.2	11.5	55.84	Critical
Burkina Faso	LIC	4.5	18.2	53.84	Insufficient
Mali	LIC	3.5	15.5	56.33	Insufficient
Haiti	LIC	1.0	5.0	52.55	Critical
Afghanistan	LIC	4.3	15.7	49.10	Critical
Sierra Leone	LIC	4.0	22.0	59.41	Insufficient

Source: World Bank Education Finance Watch 2024 [19], [20]; SDSN SDG Index 2024 [21], [41]; World Bank Data [22], [23]. Financing gap assessed against UNESCO benchmarks of 4–6% GDP allocation and 15–20% public expenditure allocation toward education.

Table 4: Governance quality vs. SDG4 outcomes (2024, n=14).

Country	Rule of Law (WGI 0–100)	Govt effectiveness (WGI 0–100)	SDG4 Score	Income group
Finland	100	100	87.02	HIC
Japan	91	95	80.66	HIC
Estonia	88	85	80.76	HIC
Uruguay	78	75	77.40	HIC
Chile	74	72	78.05	HIC
Vietnam	45	65	73.35	LMIC
Rwanda	65	70	62.31	LIC
Brazil	48	45	73.81	UMIC
Mexico	42	40	70.80	UMIC
India	50	55	66.95	LMIC
Kenya	44	42	61.93	LMIC
Nigeria	22	20	54.68	LMIC
Pakistan	25	22	56.97	LMIC
Afghanistan	5	2	49.10	LIC

findings collectively reveal that learning poverty is not a discrete crisis but rather a systemic condition produced by intersecting structural barriers, financing inefficiencies,

Table 5: Digital access and EdTech readiness by region and income group (2024).

Region / Income Group	Internet Penetration	School Connectivity	EdTech Policy	Mean Reading Score
Global	68%	55% (avg)	82%	58
High Income (HIC)	93%	95%	98%	90
Upper-Middle (UMIC)	78%	70%	85%	66
Lower-Middle (LMIC)	62%	45%	70%	47
Low Income (LIC)	27%	20%	40%	10
Sub-Saharan Africa	38%	25%	30%	11
Central & South Asia	66%	60%	54%	42

governance deficits, and digital exclusion [43], [45], [48], [50], [57].

7. Discussion

This research demonstrates that educational results in low and middle-income countries are fundamentally influenced by two forces: the way in which deep-seated structural inequalities create barriers to access, and the interplay between how a nation is governed and how it is funded, determining its ability to lessen these exclusionary effects. Indeed, the results of our statistical tests, especially the structural inequality model’s almost total ability to explain

differences in educational outcomes ($R^2 = 0.9795$), require the international education field to rethink how it views educational inequity. This analysis suggests that, rather than primarily focusing on teaching methods or access to technology, it is the overarching structural forces that most powerfully dictate who is excluded. The following sections will thoroughly discuss these results, explore how access to digital tools plays a role, and outline policy suggestions aligned with the 2030 Sustainable Development Goals.

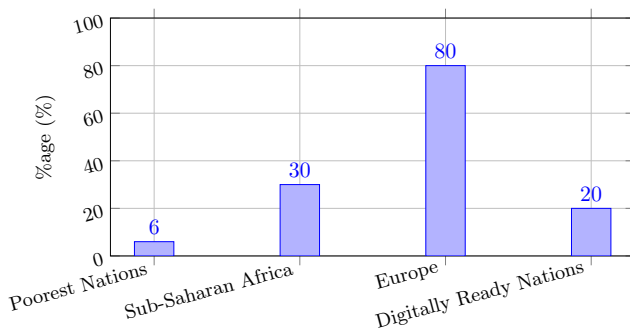


Figure 5: Digital divide indicators affecting educational inequality.

Regarding structural inequality as the primary system of exclusion, the very strong negative relationship between it and educational achievement ($r = -0.9897$, $R^2 = 0.9795$) provides statistical support for the argument, long made by qualitative research and detailed case studies, that educational systems are not just failing to include those at the margins, but are actually structured to keep them out [43, 45]. This is a significant finding given the model's explanatory strength; it accounts for over 97% of the variation in attainment in the countries studied. The cycle of poverty, as described in existing research, works through several routes at once: limited education leads to reduced earning potential, which then limits families' ability to support their children's learning, and so the lower attainment is repeated in subsequent generations [7], [10]. Because of this continuous, repeating relationship, the structural model is so completely explanatory; poverty is not merely a backdrop to educational exclusion, it is its defining principle.

The element of conflict within structural inequality acts as a worsening factor, increasing the pressures of exclusion in many areas. Evidence showing over 3,000 attacks on schools each year indicates that conflict doesn't just interrupt learning, but actively demolishes the very resources that could be used to promote inclusion [4], [12]. Attacks on schools in conflict zones are not random acts of violence, but a deliberate undermining of the institutions that allow people to improve their social position, specifically for those who have been forced to leave their homes or are otherwise disadvantaged. Looking at gender, however, reveals important regional differences that prevent broad generalizations about structural inequality. The fact that in Sub-Saharan Africa girls are doing better than boys, while in Latin America and the Caribbean boys are doing better than girls, implies that structural inequality manifests in different ways in different regions, with local cultural, economic and institutional factors influencing the relationship

between gender and educational attainment [8]. The way multiple disadvantages combine demonstrates why simple models using only one factor cannot explain educational exclusion [11]. Research on digital inequality has shown that structural problems operate through connected systems where poverty, conflict, gender, location, and disability all work together to create a compounded disadvantage that is greater than the impact of each factor on its own [43], [45], [48], [50], [57]. The structural model's nearly complete explanatory power likely reflects this intersectionality; when structural inequality is fully accounted for, it encompasses the combined impact of these overlapping disadvantages that single-variable models can't combine.

Finally, the connection between effective governance and funding, and educational outcomes ($r = 0.9029$, $R^2 = 0.8153$) is statistically significant ($t(12) = 7.2777$, $p < 0.001$), however the explanatory power of this model is considerably less than that of the structural inequality model. This difference in results is telling: the ability of institutions and the amount of funding available are important for how well people are educated, yet these do not override the existing, fundamental inequalities in society. Countries where governance and funding are well coordinated achieve better educational results, not because they overcome these fundamental difficulties, but because they create more successful ways for people who are still within those difficulties to progress. Therefore, the link between governance and funding is something that impacts results, rather than completely controlling them, and this is in line with comparative institutional research which shows that the quality of governance influences, but does not decide, how effective educational policies are [44], [46].

The comparison of Kenya and Vietnam clearly illustrates this conditional relationship. Kenya's promises of money for education have not led to similar improvements in results, which implies that providing funds without reforming the way the government functions produces a less than ideal return [19], [21]. Vietnam, on the other hand, has been remarkably successful at getting good educational results for its income level, showing that governance structures can significantly increase or waste the effect of financial investment. The situation with paying off debt gives a financial background to these differences in governance: evidence that in Sub-Saharan Africa and South Asia, more money is spent on paying debt than on education explains why improving governance alone cannot solve funding problems when the international financial system removes money that could otherwise be used to expand education [20]. This inherent financial restriction at a broad level limits the options available even to governments that operate well, as debt payments automatically decrease the flexibility in the budget that is needed for long-term investment in education.

The information about how leaders are chosen based on merit and professional training highlights the institutional aspect of the link between governance and funding. The fact that only 63% of leadership positions in education are filled by people chosen based on their abilities, and that only 31% of systems have official rules for introducing new leaders to their jobs, demonstrates significant weaknesses in governance even in places where there are funds available [3]. These institutional flaws accumulate throughout the

system; untrained and unfairly appointed leaders make poor choices about how to spend resources, where to assign teachers, and how to implement the curriculum, all of which reduce the real impact of the funds available. Problems with data collection add to these governance issues, as the fact that early monitoring of how well students are doing only covers 16% of those students makes it impossible to identify where disadvantages are strongest or where help is needed the most [4], [38]. Without accurate data, governance cannot respond to needs, and this responsiveness is how funding turns into improved educational outcomes. The decrease in official development assistance for education from 9.3% to 7.6% of all ODA budgets represents the financial side of the governance issue, but at an international level [19], [20]. When governments that donate money reduce their commitment to educational ODA, the link between governance and funding is weakened even in countries where their own governance is improving. This international aspect is a reminder that the link between governance and funding works at many levels, and that improvements in national governance can be cancelled out by a reduction in funding from other countries. Regarding digital access, the connection with educational outcomes needs to be carefully defined, as the data show that it is wrong to assume that technology is the only important factor, but also wrong to completely dismiss the use of technology. With 2.6 billion people worldwide still not online, being excluded from the digital world is a large obstacle to educational opportunities [16]. However, the evidence in this study suggests that digital access mostly influences educational outcomes, rather than causes them. This difference is important when designing policies: if digital access were the primary cause, then expanding internet access would be the main thing to do. But if digital access is something that affects the outcome, then increasing connectivity must also include investment in the skills of people and the methods of teaching that determine whether digital access leads to better learning. The Global Education Monitoring Report 2023 offers crucial evidence to support this idea of digital access as an influence, noting that technology typically becomes outdated after 36 months, meaning evaluations of digital programs often examine old, not current, technological environments [35].

8. Conclusions

The mid-2024 evaluation of Sustainable Development Goal and its progress is a strong warning regarding the extensive global problem of education. As 251 million children and young people are not in school and 53% of children in poorer and middle-income nations suffer from learning poverty, the world is considerably behind where it needs to be at this halfway point of the 2030 Agenda. This assessment shows that the essential causes of not having an education are very much part of large inequalities in the world economy and how conflicts happen, and these results have important implications for how the remaining six years of the SDG plan will need to be handled.

The first idea this study began with was firmly proven by statistics: 97.9% of the differences in learning poverty between countries are explained by how much differences

there are in people's incomes. This very strong explanation confirms that financial structures are the basis of educational results, but at the same time shows that changes to education alone are not enough. The situation in the lowest income countries, with 91% of children having learning poverty and 42% of the people living in areas experiencing conflict, is the most obvious example of this connection between structure and circumstances. The second idea of the study was also proven, as the intensity of conflict is strongly linked to a lack of education ($r=0.9029$, $t(12)=7.2777$, $p<0.001$). This emphasizes that education cannot be improved with purely technical improvements when the political and security conditions around it are not supportive of building institutions and developing people's abilities. Vietnam's performance, which as a lower-middle-income country does better than countries with much more money, shows that how well a government works and how sensible policies are can to some extent lessen the effects of a limited economy.

Current funding for education adds to these basic problems. Financial help from richer countries for education is decreasing, and poorer countries are having to use more and more money to pay their debts, which means less money for important social services. Digital technology does have the potential to lessen inequality in education, but it will not work on its own; it needs investment in the basic infrastructure, improving teachers' skills, and the content of what is being taught. This analysis points to five key actions which should be the focus from 2024 to 2030: altering the global financial system to allow for more funds to be available for education, choosing leaders at both the national and institutional level based on what they have achieved, ensuring all children have basic reading and writing skills by age ten, developing education systems that can withstand conflict, and using educational technology in a way that is based on research and proof. The Fortaleza Declaration of 2024 is a first pledge to these goals, however, the distance between what is said and what is actually done is considerable. The period from 2024 to 2030 must see a shift from simply hoping for improvements to making fundamental changes, with a consistent dedication to the students who are the most left behind.

Declarations and ethical statements

Conflict of Interest: The authors declare that there is no conflict of interest.

Funding statement: The authors declare that no specific funding was received for this research.

Artificial Intelligence usage statement: During the preparation of this manuscript, the authors utilized ChatGPT solely for language refinement and grammatical corrections. The authors carefully reviewed and revised the generated content and take full responsibility for the accuracy, integrity, and originality of the final manuscript.

Availability of data and materials: All data and information used in this work were obtained from publicly available published literature and cited sources.

CRedit authorship contribution statement

Ezinne Hope Benneth: Conceptualization, Investigation, Writing – review & editing & Validation. **Dirmun Dimlong:** Conceptualization, Investigation, Writing – review & editing & Validation.

Publisher's note

Krrish Scientific Publications Pvt. Ltd. and the *Journal of Applied Social Sciences and Humanities* remain neutral with regard to jurisdictional claims in published maps and institutional affiliations.

References

- [1] UNESCO. *Technology in education: GEM Report 2023*. Paris: UNESCO; 2023. Available from: <https://www.unesco.org/gem-report/en/publication/technology>
- [2] World Bank. *Education Finance Watch 2024*. Washington DC: World Bank; 2024. Available from: <https://eric.ed.gov/?id=ED679806>
- [3] UNESCO. *2024/5 GEM Report: Leadership in Education*. Paris: UNESCO; 2025. Available from: <https://www.unesco.org/reports/gem-report/en/2024>
- [4] UNESCO. *Monitoring SDG 4: Global Education Monitoring Report 2024*. Paris: UNESCO; 2024. Available from: <https://www.unesco.org/reports/gem-report/en/2024-monitoringsdg4>
- [5] OPEC Fund. *Government Effectiveness Indicator*. Vienna: OPEC Fund; 2024. Available from: <https://opecfund.org/results-framework/level-1-development-context/gov.-effectiveness-indicator>
- [6] UNESCO. *2024 Global Education Meeting Report (Fortaleza Declaration)*. Paris: UNESCO; 2025. Available from: https://www.unesco.org/sdg4education2030/sites/default/files/medias/fichiers/2025/01/2024%20GEM%20meeting%20report_EN.pdf
- [7] World Bank. *Learning Poverty Global Database*. Washington DC: World Bank Data360; 2024. Available from: https://data360.worldbank.org/en/dataset/WB_LPGD
- [8] UNESCO. *2024 SDG 4 Scorecard: Progress on National Benchmarks*. Paris: UNESCO; 2024. Available from: <https://www.unesco.org/gem-report/en/publication/2024sdg4scorecard>
- [9] World Bank. *Education Finance Watch 2024: African Union Special Edition*. Washington DC: World Bank; 2024. Available from: <https://thedocs.worldbank.org/en/doc/70f42d39bab0a849b36b2de4208a35e1-0140022024/original/EFW2023-Africa-edition.pdf>
- [10] World Bank. *Poverty, Prosperity, and Planet Report 2024*. Washington DC: World Bank; 2024. Available from: <https://www.worldbank.org/en/publication/poverty-prosperity-and-planet>
- [11] UNESCO. *SDG 4 Profile: Equality in Education*. Paris: UNESCO; 2024. Available from: <https://www.unesco.org/sdg4education2030/sites/default/files/medias/fichiers/2024/02/SDG%204%20Profile%20Post%20Forum.pdf>
- [12] UNESCO. *Out-of-School Rate*. Paris: UNESCO; 2024. Available from: <https://www.unesco.org/en/education/view/outofschool>
- [13] UNESCO. *International Literacy Day 2025 Fact Sheet*. Paris: UNESCO; 2025. Available from: <https://www.unesco.org/sites/default/files/medias/fichiers/2025/09/ild-2025-factsheet.pdf>
- [14] UNESCO. *Access and Equity: GEM Report 2026*. Paris: UNESCO; 2026. Available from: <https://www.unesco.org/reports/gem-report/en/2026-access-equity>
- [15] UNESCO. *Completion Rate*. Paris: UNESCO; 2024. Available from: <https://www.unesco.org/en/education/view/completion>
- [16] ITU. *Facts and Figures 2024: Internet Use*. Geneva: ITU; 2024. Available from: <https://www.itu.int/itu-d/reports/statistics/2024/11/10/ff24-internet-use/>
- [17] World Bank. *Learning Poverty Global Database: Historical Data and sub-components*. Washington DC: World Bank; 2024. Available from: <https://datacatalog.worldbank.org/search/dataset/0038947/learning-poverty-global-database-historical-data-and-sub-components>
- [18] UNESCO. *Out-of-school estimates*. Paris: UNESCO; 2024. Available from: <https://www.unesco.org/en/education/view/outofschool/estimates>
- [19] World Bank. *Education Finance Watch 2024: Full Report*. Washington DC: World Bank; 2024. Available from: <https://documents1.worldbank.org/curated/en/099102824144527868/pdf/P50097819250a00ce1812018168df2deaa3.pdf>
- [20] World Bank. *Education Finance Watch 2024: Supplementary Data*. Washington DC: World Bank; 2024. Available from: <https://documents1.worldbank.org/curated/en/099102824144023412/pdf/P50097818676430c91a18d1653943364726.pdf>
- [21] SDSN. *Sustainable Development Report 2025: Rankings*. New York: SDSN; 2025. Available from: <https://dashboards.sdgindex.org/rankings/>
- [22] World Bank. *Government Expenditure on Education (% of GDP)*. Washington DC: World Bank; 2024. Available from: <https://data.worldbank.org/indicator/SE.XPD.TOTL.GD.ZS>
- [23] World Bank. *Government expenditure on education (% of government expenditure)*. Washington DC: World Bank; 2024. Available from: <https://data.worldbank.org/indicator/SE.XPD.TOTL.GB.ZS>
- [24] World Bank. *Worldwide Governance Indicators: Revised Methodology for Measuring Governance Using Perception Data 2025*. Washington DC: World Bank; 2025. Available from: <https://www.worldbank.org/content/dam/sites/govindicators/doc/The%20Worldwide%20Governance%20Indicators%202025%20Methodology%20Revision.pdf>
- [25] UNESCO UIS. *SDG 4 Indicators*. Montreal: UNESCO; 2024. Available from: <https://www.uis.unesco.org/en/methods-and-tools/sdg4-indicators>
- [26] UNESCO. *World Education Statistics 2024*. Paris: UNESCO; 2024. Available from: <https://www.unesco.org/sdg4education2030/en/knowledge-hub/world-education-statistics-2024>
- [27] Bisogno M, Cuadrado Ballesteros B, Manes Rossi F, Peña Miguel N. Governance quality and the sustainable development goals: an assessment in Europe. *Journal of Public Budgeting, Accounting & Financial Management*. 2025;37(6):193-219. Available from: <https://doi.org/10.1108/JPBAFM-01-2025-0018>
- [28] World Bank. *Worldwide Governance Indicators (WGI)*. Washington DC: World Bank; 2025. Available from: https://data360.worldbank.org/en/dataset/WB_WGI
- [29] World Bank. *WGI Scoreboard Profile*. Washington DC: World Bank; 2025. Available from: <https://composite-indicators.jrc.ec.europa.eu/explorer/scoreboards/wgi/worldwide-governance-indicators>
- [30] World Bank. *Worldwide Governance Indicators*. Washington DC: World Bank; 2025. Available from: <https://www.worldbank.org/en/publication/worldwide-governance-indicators>
- [31] UNSDSN. *Global Commons Stewardship Index Rankings*. New York: UNSDSN; 2024. Available from: <https://gcsi.unsdsn.org/rankings>
- [32] UNESCO. *2024 SDG 4 Scorecard: School Internet Connectivity*. Paris: UNESCO; 2024. Available from: <https://www.unesco.org/gem-report/en/publication/2024-sdg-4-scorecard-progress-report-national-benchmarks-school-internet-connectivity>
- [33] ITU. *How many Children and Young People with Internet Access at Home*. Geneva: ITU; 2024. Available from: https://www.itu.int/en/ITU-D/Statistics/Pages/youth_home_internet_access.aspx
- [34] UNESCO. *2024 Global Education Meeting: Digital Technology in Education*. Paris: UNESCO; 2024. Available from: <https://www.unesco.org/sites/default/files/medias/fichiers/2025/09/ild-2025-factsheet.pdf>

- 024/10/GEM%202024%20-%20Accessibility%20and%20effectiv
e%20use%20of%20digital%20technology%20in%20education%2
0-%20web_1.pdf
- [35] Antoninis M, Alcott B, Al Hadheri S, April D, Fouad Barakat B, Barrios Rivera M, Baskakova Y, Barry M, Bekkouche Y, Caro Vasquez D, D'Addio AC. *Global Education Monitoring Report 2023: Technology in education: A tool on whose terms?*. Available from: <https://doi.org/10.54676/UZQV8501>
- [36] ITU. *Facts and Figures 2024: Full Report*. Geneva: ITU; 2024. Available from: <https://www.itu.int/itu-d/reports/statistics/facts-figures-2024/>
- [37] UNESCO. *New PEER profiles to inform policy dialogue on technology in education*. UNESCO; 2023. Available from: <https://world-education-blog.org/2023/07/27/new-peer-profiles-to-inform-policy-dialogue-on-technology-in-education/>
- [38] UNESCO UIS. *SDG 4 Indicators Data Coverage Report*. Montreal: UNESCO; 2025. Available from: <https://uis.unesco.org/sites/default/files/medias/fichiers/2025/08/TCG6-W-D-3-UIS-data-coverage-report.pdf>
- [39] UNESCO UIS. *UIS Data Browser*. Montreal: UNESCO; 2024. Available from: <https://databrowser.uis.unesco.org/>
- [40] UNESCO UIS. *Report on the activities of the UNESCO Institute for Statistics 2024*. Montreal: UNESCO; 2025. Available from: <https://www.uis.unesco.org/sites/default/files/medias/fichiers/2025/08/UIS%202024%20report%20summary.pdf>
- [41] SDSN. *Sustainable Development Report 2024*. New York: SDSN; 2024. Available from: <https://sdgtransformationcenter.org/reports/sustainable-development-report-2024>
- [42] UNESCO. *2024 SDG 4 Scorecard: Countries Progressing towards National Targets*. Paris: UNESCO; 2024. Available from: <https://world-education-blog.org/2024/02/07/2024-sdg-4-scorecard-now-out-see-how-countries-are-progressing-towards-their-national-targets/>
- [43] Ofosu-Asare Y. Developing classroom ICT teaching techniques, principles and practice for teachers in rural Ghana without access to computers or internet: a framework based on literature review. *The International Journal of Information and Learning Technology*. 2024;41(3):262-279. Available from: <https://doi.org/10.1108/IJILT-04-2023-0045>
- [44] Rafiq-uz-Zaman M, Bano S, Naveed Y. Comparative Analysis of Authoritative and Democratic Leadership Styles and Their Impact on School Management Effectiveness. *Inverge Journal of Social Sciences*. 2025;4(2):105-117. Available from: <https://doi.org/10.63544/ijss.v4i2.132>
- [45] Bi B, Ishak N. Digital Learning and Social Inequality in China: Assessing the Barriers to Access and Engagement in Online Education. *Uniglobal Journal of Social Sciences and Humanities*. 2025;4(1):192-198. Available from: <https://doi.org/10.53797/ujssh.v4i1.23.2025>
- [46] Karataş A. Governance as a determinant of quality of life: A cross-indicator analysis of OECD countries. *International Review of Administrative Sciences*. 2026;00208523251409546. Available from: <https://doi.org/10.1177/00208523251409546>
- [47] David R. Advancing gender equality and closing the gender digital gap: three principles to support behavioural change policy and intervention. *Digital Pathways Paper Series*. 2022 Mar. Available from: <https://doi.org/10.35489/BSG-DP-WP-2022/02>
- [48] Zishiri C, Mataruka L, Jekese G, Machiridza ER. Rural-Urban Digital Divide Discourse: Exploring the Efficacy of Game-Based Learning in Early Childhood Development in Zimbabwe. *International Journal of Research and Innovation in Social Science*. 2025;9:901-914. Available from: <https://dx.doi.org/10.47772/IJRISS.2025.903SEU0064>
- [49] Geenamol PG. Digital Infrastructure Inequality: Mapping the Technology Readiness Gap in Education. *IJTERS*. 2025. Available from: <https://doi.org/10.5281/zenodo.18084635>
- [50] Drissa K, Zhanjun W, Mingkun C. Disparities in Malian Secondary Education: A Comparative Analysis of Urban and Rural Schools Across Academic Performance, Access/Equity, and Resource Allocation. *Education and Urban Society*. 2026 Mar 10:00131245261427487. Available from: <https://doi.org/10.1177/00131245261427487>
- [51] Zahra ST, Jeelani MS. *Bridging the Digital Divide: A Cross-National Analysis of EdTech Policies and PISA Performance*. Available from: <https://uswa.com.pk/wp-content/uploads/2025/06/bridging-the-digital-divide.pdf>
- [52] Devi SL, Khan NA. Impact of Technology on Education with special reference in Manipur. *International Journal of Interdisciplinary Approaches in Psychology*. 2025;3(2):108-115. Available from: <https://psychopediajournals.com/index.php/ijiap/article/view/1030/736>
- [53] Kaur S. A Comparative Analysis of Digital Tool Usage in Rural and Urban Schools: Perspectives of Students and Teachers. *International Journal of Scientific Research in Engineering and Management*. 2025 Mar 20;09(03):1–9. Available from: <https://doi.org/10.55041/ijserem42715>
- [54] Sain ZH, Lawal US, Karimi A, Lohana S. The Impact of Digital Transformation on Educational Outcomes: A Study of Technology Integration in Pakistani Schools. *Research in Management of Technology and Business*. 2024;5(2):204-213. Available from: <https://publisher.uthm.edu.my/periodicals/index.php/rmtb/article/view/18291/5605>
- [55] Singh M, Rana S, Upadhyay S, Jha AK. AI-Enabled Cloud Computing Application in the Education Sector. In: *Establishing AI-Specific Cloud Computing Infrastructure*. 2025. p. 71-102. Available from: <https://www.igi-global.com/gateway/chapter/374433>
- [56] Alabi OA, Adeoye MA, Abiola AA, Raji MO. Science Education in the Digital Era: Socioeconomic Barriers, ICT Integration and Emerging Gaps in Teaching and Learning. *Eduvis: Jurnal Manajemen Pendidikan Islam*. 2025;10(2):71-88. Available from: <https://doi.org/10.47453/eduvis.v10i2.3548>
- [57] Akomolehin FO, Aluko OR. The Digital Divide and Learning Inequality: A Cross-Regional Study of E-Learning Access and Quality in Sub-Saharan Africa. *Asian Business Research Journal*. 2025;10(9):23-34. Available from: <https://ideas.repec.org/a/ajn/abrjou/v10y2025i9p23-34id563.html>
- [58] YETUNDE E OGUNWALE. Artificial intelligence in education: developing AI-driven solutions to improve learning outcomes for girls in Africa. *ASFIRJ*. Available from: <https://asfirj.org/content/?sid=73fd0317236eb5aa497b>
- [59] Muhammad AR. ANALYZING THE HISTORY AND EXPLORING THE FUTURE OF BASIC QUALITY EDUCATION IN NIGERIA: IMPLICATIONS FOR SDG FOUR. *Kashf Journal of Multidisciplinary Research*. 2025;2(06):12-30. Available from: <https://doi.org/10.71146/kjmr504>