



ISSN: 2584-2455

International Journal for Research Trends in Social Science & Humanities

Volume 4, Issue 5

Sep-Oct 2026, PP 1-24

A Comparative Analysis of Global Educational Systems: Then and Now

Dr. K. Chitra

B.Tech, MBA, Ph.D, Research Associate, The Mother's Service Society, Pondicherry

Abstract- Global education has undergone a transformation of extraordinary scale. During the middle of the twentieth century, formal schooling remained inaccessible to large sections of the world's population, secondary education was far from universal, higher education served a relatively small elite, and knowledge was distributed mainly through teachers, textbooks, libraries and institutional settings. By contrast, the contemporary educational landscape is characterized by mass participation, rising completion rates, large-scale higher education, international measurement of learning outcomes, digital platforms, hybrid learning, expanding expectations for lifelong learning and the rapid emergence of generative artificial intelligence. Yet this transformation has produced a paradox. Access to schooling has improved much faster than the capacity of all systems to guarantee meaningful learning, equitable progression and relevant capabilities. This article examines that paradox through a comparative historical and statistical analysis of global education from approximately 1950 to the present. The study synthesizes evidence from UNESCO and the UNESCO Institute for Statistics, the United Nations Sustainable Development Goal monitoring framework, the World Bank, OECD/PISA, UNICEF, ITU and major peer-reviewed research. It compares changes in enrolment, completion, exclusion, learning poverty, international assessment performance, teacher supply, digital connectivity, tertiary participation, gender and socioeconomic inequality, education finance, pedagogy and the emerging role of artificial intelligence. The analysis distinguishes carefully between indicators that are directly comparable over time and indicators whose definitions or population coverage differ. The evidence shows remarkable progress. UNESCO reports that about 47% of children aged 5–14 were enrolled in school in 1950, whereas contemporary participation is close to 90% at primary age and 86% at lower-secondary age [1]. Global completion rates rose between 2015 and 2024 from 85% to 88% in primary education, from 74% to 78% in lower secondary education and from 53% to 60% in upper secondary education [6]. Tertiary participation has expanded from roughly 10% of the relevant age cohort around 1970 to more than 40% in the contemporary period [2], [7]. At the same time, 272 million children and youth remained out of school in 2024, the out-of-school rate was 36% in low-income countries compared with 3% in high-income countries, and learning poverty was estimated at 70% among ten-year-olds in low- and middle-income countries in 2022 [3], [6]. OECD PISA 2022 also recorded historically large declines in mathematics and reading performance compared with 2018 [4]. The article concludes that the defining educational challenge has shifted. The twentieth century was dominated by a problem of educational scarcity: insufficient school places, teachers and opportunities. The twenty-first century increasingly confronts a multidimensional problem of capability: ensuring that access leads to completion, that completion leads to learning, and that learning develops the knowledge, judgment, creativity, adaptability and ethical capacity needed in a digital and AI-rich world. Educational progress should therefore be evaluated not simply by how many students enter institutions, but by what they actually learn, how equitably they learn it, and how



ISSN: 2584-2455

effectively they can apply knowledge in changing social and technological environments.

Keywords—comparative education, global education, educational inequality, learning outcomes, learning poverty, PISA, digital divide, teacher shortage, tertiary education, artificial intelligence, SDG 4.

I. Introduction

Education is one of the few institutions that simultaneously shapes individual life chances, national productivity, social cohesion, citizenship, health, technological capacity and the intergenerational transmission of culture. For that reason, changes in education are not merely changes in schools. They alter the way societies reproduce knowledge, distribute opportunity and prepare people for economic and civic life. During the past seventy-five years, the scale of this transformation has been particularly striking. The world has moved from a situation in which large numbers of children never entered formal schooling to one in which school participation is the expected norm in most countries. Secondary and tertiary education have also expanded from relatively selective stages of education into mass systems in many regions.

The phrase “then and now” can easily become superficial if it is used to contrast an allegedly rigid past with a uniformly progressive present. Educational history is far more complicated. Some earlier systems developed rigorous intellectual traditions, community-based teaching and strong professional identities among teachers, while some contemporary systems continue to rely heavily on memorization, high-stakes examinations and unequal access to quality institutions. Accordingly, this paper uses “then” and “now” as analytical periods rather than moral categories. “Then” refers mainly to the era of mass-schooling expansion from approximately 1950 to 2000. “Now” refers primarily to the period from 2000 to 2026, in which universal-access goals, international assessments, digitalization, global mobility and artificial intelligence increasingly shape education policy.

The central research problem is whether the remarkable expansion of formal education has been matched by equivalent progress in learning and human capability. This distinction matters because enrolment is an input or participation measure, not a direct measure of what students understand. A country can increase school attendance rapidly while still facing weak literacy, inadequate numeracy, high dropout rates or large socioeconomic achievement gaps. Conversely, high-performing systems can experience declining outcomes even when enrolment and spending remain high. A meaningful comparison must therefore move beyond counting students and institutions to examine the entire educational process.

This article develops the concept of an access–learning paradox. The paradox does not suggest that expansion was a mistake; universal access is a foundational achievement. Rather, it highlights that successful expansion changes the nature of the policy problem. Once most children are in school, the central questions become whether they remain in school, whether they master foundational skills, whether disadvantages are compensated rather than reproduced, and whether curricula remain relevant to changing



ISSN: 2584-2455

societies. The arrival of generative AI intensifies these questions because it alters the conditions under which information is produced and accessed.

II. Research Questions and Analytical Framework

The study is organized around five research questions. First, how has participation and completion changed across primary, secondary and tertiary education? Second, has greater access been accompanied by equivalent improvement in learning outcomes? Third, how have inequalities changed in form, particularly across income, gender and digital access? Fourth, what constraints in teacher supply, financing and institutional capacity limit quality? Fifth, how does the transition toward digital and AI-supported learning affect the traditional functions of teachers, curricula and assessment?

To answer these questions, the analysis uses a six-stage educational results chain: Access → Participation → Completion → Learning → Capability → Application. Each stage represents a different level of educational success. Access concerns the availability and affordability of schooling. Participation concerns actual enrolment and attendance. Completion concerns persistence through a level of education. Learning concerns knowledge and skills acquired. Capability refers to the learner's ability to reason, adapt, communicate and solve problems. Application concerns the use of these capabilities in employment, citizenship, further learning and social life.

The framework is useful because policy debates often collapse these stages into one another. A rise in enrolment is sometimes treated as evidence of improved education even when learning data remain weak. Similarly, completion can increase because promotion policies change without a corresponding improvement in mastery. By separating the stages, the paper can identify where historical progress has been strongest and where contemporary systems continue to struggle.

III. Data Sources, Indicator Selection and Method

This study is a comparative secondary-data synthesis rather than a new household survey or experimental investigation. The evidence base prioritizes internationally harmonized or institutionally authoritative sources. UNESCO and the UNESCO Institute for Statistics provide historical participation estimates, education indicators and teacher data. United Nations SDG monitoring is used for recent completion and out-of-school measures. The World Bank and partner organizations provide the learning-poverty estimate. OECD PISA supplies internationally comparable achievement data for 15-year-olds. UNICEF and ITU provide the digital-connectivity evidence, while peer-reviewed literature is used to interpret massification, human capital, learning theory and the economics of education.

The analysis applies three rules to reduce overstatement. First, direct percentage-point comparisons are made only when indicator definitions and populations are sufficiently similar. Second, when a historical figure and a contemporary figure refer to related but not identical populations, the comparison is presented as a broad



ISSN: 2584-2455

structural indicator rather than a precise time-series estimate. Third, the paper distinguishes association from causation. For example, PISA scores fell sharply between 2018 and 2022, but this does not establish that pandemic school closures alone caused the decline; OECD evidence indicates that some negative trends predated the pandemic [4], [40].

A further methodological limitation is that global averages can conceal major differences among countries. The educational experience of a high-income country with near-universal secondary completion is not comparable to that of a conflict-affected low-income country struggling to provide basic access. The paper therefore combines global averages with selected distributional evidence, particularly the 36% versus 3% out-of-school contrast between low- and high-income country groups [6]. Where possible, the text interprets the statistic in terms of what it reveals about system structure rather than treating the global mean as representative of every country.

However, AI should not automatically replace human judgement. Decision quality depends on data quality, algorithmic transparency, managerial interpretation and ethical governance.

Table I. Selected Indicators Of Global Educational Transformation

Indicator	Earlier benchmark	Recent benchmark	Interpretive caution
School participation	47% of ages 5–14 enrolled (1950)	~90% primary-age; ~86% lower-secondary-age	Historical and current age groupings are related but not identical.
Completion	85/74/53% in 2015 (primary/lower/upper secondary)	88/78/60% in 2024	Comparable SDG completion series.
Out of school	—	272 million in 2024	Affected by demographic growth as well as rates.
Learning poverty	—	70% in LMICs, 2022 estimate	Measures inability to read and understand an age-appropriate text by age 10.
PISA change	2018 baseline	Math ~-15; reading -10; science ~0, OECD average, 2022	Applies to participating 15-year-olds, not all students globally.
Tertiary participation	~10% around 1970	>40% contemporary	Approximate long-run comparison; regional variation is large.

IV. Expansion of Educational Access:

From Scarcity to Mass ParticipationThe clearest long-run achievement of modern education is the expansion of access. UNESCO reports that around 47% of children aged 5–14 were enrolled in school in 1950 [1]. Contemporary participation is approximately 90% among children of primary-school age and 86% among children of



ISSN: 2584-2455

lower-secondary-school age [1]. Although these categories are not perfectly identical, the contrast captures a profound institutional change: schooling has moved from being unavailable to a large share of the world's children to being the expected experience of childhood across most societies.

This expansion was produced by several mutually reinforcing forces. Post-war governments invested in public school construction and teacher recruitment; compulsory-schooling laws became more widespread; decolonizing states treated education as a central component of nation-building; international institutions increasingly framed education as a right; fertility declines in some regions reduced pressure on school systems; and rising incomes made longer schooling economically and socially feasible. The 1948 Universal Declaration of Human Rights gave the process an important normative foundation by identifying education as a universal right [5].

Access expansion also changed who entered the classroom. Historically, exclusion was frequently structured by gender, rural residence, poverty, caste or social status, race, disability and geography. Expansion therefore had consequences that extended beyond education statistics. It altered labour-force participation, family aspirations, political participation, migration patterns and the expected transition from childhood to adulthood. The classroom became one of the principal institutions through which modern states interacted with the population.

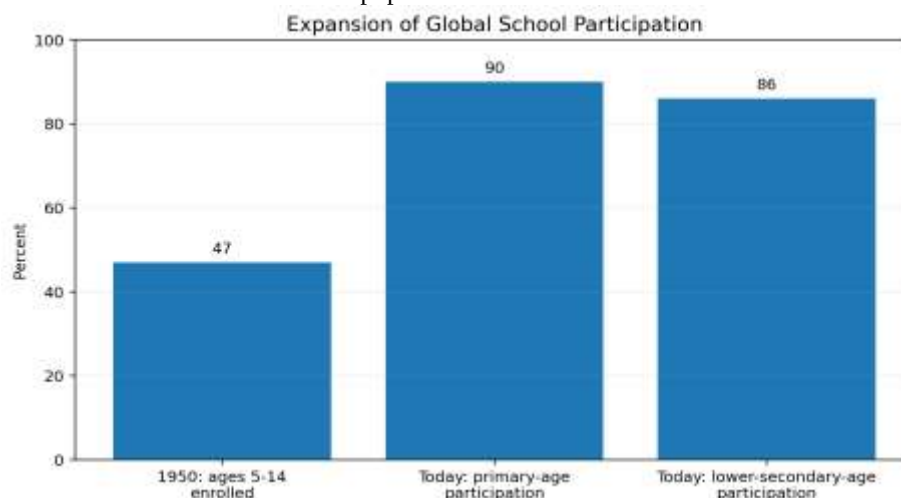


Fig. 1. Expansion of global school participation. Sources: UNESCO [1]. The historical and current measures use related but not identical age categories and should be interpreted as a broad structural comparison.

Yet access should not be confused with equality. When an education system expands, inequality often shifts from whether a child enters school to which school the child attends, the quality of teaching received, the probability of progressing to secondary or tertiary education, and the resources available outside school. Mass participation can therefore reduce one form of inequality while revealing another. This is why contemporary analysis needs to examine completion, learning and quality after access



ISSN: 2584-2455

has improved. As shown in Fig. 1, the long-run expansion of school participation is one of the clearest structural changes in global education.

V. Completion

Progress with a Slowing Upper-Secondary Transition Enrolment indicates that students enter an educational level; completion indicates whether they persist long enough to finish it. This distinction is crucial because systems can achieve high entry rates while losing substantial numbers of learners before the end of primary or secondary school. Completion is therefore a more demanding test of institutional capacity, household affordability, student engagement and the perceived value of education.

UN SDG reporting shows that global completion improved at all three major school levels between 2015 and 2024. Primary completion increased from 85% to 88%, lower-secondary completion from 74% to 78%, and upper-secondary completion from 53% to 60% [6]. In absolute percentage-point terms, upper-secondary education recorded the largest gain, at seven points. The result is encouraging because upper-secondary completion is increasingly important for entry into skilled employment and tertiary education.

The same data, however, reveal that the world remains far from universal upper-secondary completion. A 60% global completion rate means that roughly four in ten young people do not complete this level. The difficulty is not merely one of school availability. Upper-secondary participation is more sensitive to opportunity costs, labour-market pressures, early marriage, household income, examination bottlenecks, perceived returns to schooling and the availability of relevant pathways. In other words, as education systems move upward through the levels, the determinants of persistence become more complex.

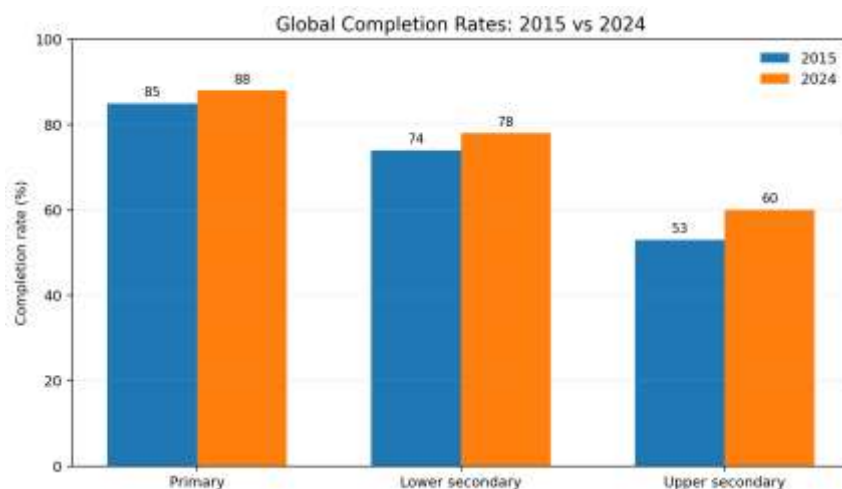


Fig. 2. Global completion rates in 2015 and 2024. Source: United Nations SDG reporting [6].



ISSN: 2584-2455

Progress has also slowed. The UN reports that the annual increase in upper-secondary completion declined from about 1.3 percentage points per year in 2010–2015 to about 0.8 points per year in 2015–2024 [6]. This slowdown matters because the remaining population is often harder to reach. Early expansion typically benefits learners who face relatively modest barriers; later expansion requires targeted interventions for remote populations, poor households, conflict-affected communities, students with disabilities and learners who need flexible or second-chance routes. Fig. 2 shows that completion improved at all three levels between 2015 and 2024, although the remaining gap becomes larger at higher levels of education

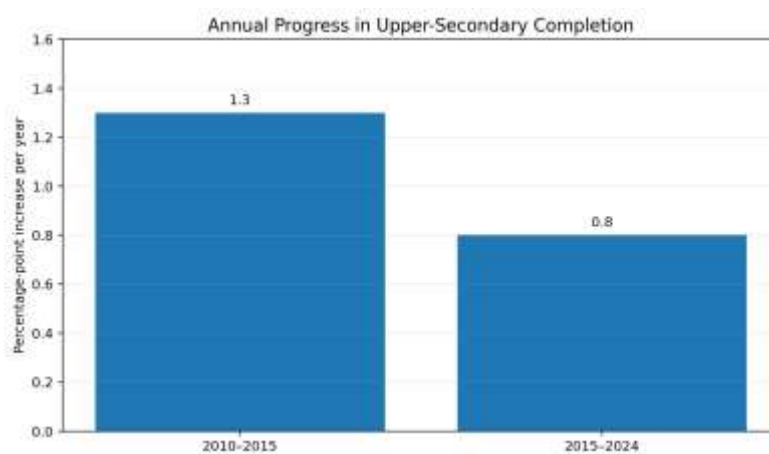


Fig. 3. Slowing annual progress in global upper-secondary completion. Source: United Nations [6].

VI. Persistent Exclusion: Why the Global Average Conceals Deep Inequality

The expansion of mass education has not eliminated exclusion. In 2024, approximately 272 million children and youth remained out of school worldwide [6]. This number is important for two reasons. First, it is large enough to show that universal education is unfinished even after decades of international commitment. Second, the total out-of-school population increased by around 3% compared with 2015, illustrating that demographic growth, conflict and stalled progress can offset gains in enrolment rates.

The inequality hidden inside the global total is even more striking. In low-income countries, approximately 36% of school-aged children and youth were out of school in 2024, compared with only 3% in high-income countries [6]. The ratio is $36/3 = 12$. Thus, on this indicator, children and youth in low-income country settings were exposed to an out-of-school rate about twelve times the rate observed in high-income countries. This is not a small residual difference at the margins of otherwise universal systems; it represents a fundamentally different educational environment.



ISSN: 2584-2455

The comparison also illustrates why simple global averages can be misleading. A high worldwide enrolment rate can coexist with severe concentrations of exclusion in particular countries and regions. More than half of the out-of-school population identified in recent SDG reporting lives in sub-Saharan Africa [6]. In such contexts, the challenge may include rapid population growth, teacher shortages, long travel distances, weak infrastructure, conflict, displacement and public financing constraints. Solutions that are effective in already universal systems—such as improving digital course choice or redesigning assessments—cannot substitute for the basic task of building and staffing schools where access remains limited.

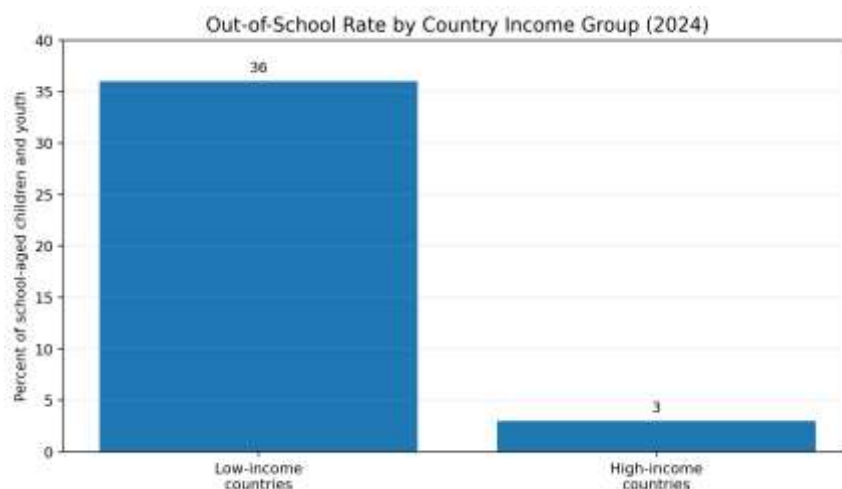


Fig. 4. Out-of-school rate by country income group, 2024. Source: United Nations [6].
The low-income rate is approximately twelve times the high-income rate.

This persistence of exclusion suggests that contemporary education policy must operate on two levels simultaneously. Some countries are debating AI-enabled tutoring and advanced competency frameworks, while others still need enough classrooms and teachers to deliver foundational education. The phrase “global education system” therefore describes a shared policy domain, not a uniform stage of development. Fig. 4 makes the income-related exclusion gap visible: the out-of-school rate in low-income countries is about twelve times that of high-income countries.

VII. The Access–Learning Paradox

The strongest reason to look beyond enrolment is the global learning crisis. The World Bank, UNESCO, UNICEF and partners estimated in 2022 that approximately 70% of ten-year-olds in low- and middle-income countries were in “learning poverty,” meaning that they could not read and understand a simple age-appropriate text [3]. The estimate represented a sharp deterioration compared with pre-pandemic expectations and captured the combined effect of pre-existing learning deficits and the disruption associated with COVID-19.



ISSN: 2584-2455

Reading by around age ten is often treated as a gateway capability because the function of literacy changes after the early primary years. In the first years of schooling, children are largely learning to read. Later, they increasingly need to read in order to learn science, social studies, mathematics word problems and other subjects. Weak reading comprehension therefore creates cumulative disadvantage. A learner who falls behind in foundational literacy can remain enrolled for years while gaining relatively little from increasingly complex curricula.

The concept of learning poverty also reveals why “years of schooling” is an incomplete measure of human capital. Two students can spend the same number of years in school and emerge with very different skills. Hanushek and Woessmann have shown that cognitive skills are strongly related to long-run economic outcomes and that schooling quantity and learning quality should not be treated as interchangeable [26], [27]. The policy implication is not that enrolment matters less, but that the return on expanded access depends on what happens inside the classroom.

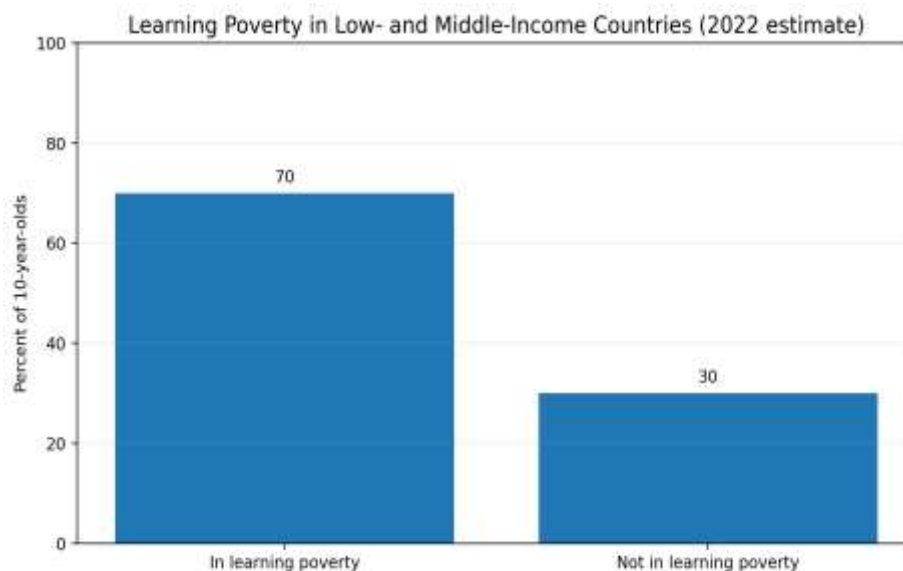


Fig. 5. Learning poverty in low- and middle-income countries, 2022 estimate. Source: World Bank and partner organizations [3].

At the system level, the access–learning paradox can arise for several reasons. Rapid expansion may produce overcrowded classrooms, shortages of qualified teachers and weaker instructional support. Curricula may be too ambitious relative to students’ actual learning levels. Promotion policies can advance students without mastery. Language of instruction may differ from the language spoken at home. Poor nutrition, health, household stress and limited learning resources can reduce the benefit of school attendance. These mechanisms vary by country, which is why learning poverty should be treated as a diagnostic indicator rather than a single-cause explanation. As shown in Fig. 5, the learning crisis extends beyond access: a large majority of 10-year-olds in low- and middle-income countries were estimated to be in learning poverty in 2022.



ISSN: 2584-2455

VIII. PISA Evidence: A Recent Shock to Learning Outcomes in Advanced and Middle-Income Systems

The learning crisis is not confined to countries struggling with basic access. OECD's Programme for International Student Assessment (PISA) examines the performance of 15-year-olds in mathematics, reading and science across participating countries and economies. PISA 2022 assessed nearly 700,000 students in 81 countries and economies [4], [40]. Because the assessment focuses on the ability to apply knowledge to problems rather than reproduce a national curriculum, it provides a useful—though not complete—view of comparative learning outcomes.

Between 2018 and 2022, average mathematics performance across OECD countries fell by almost 15 score points, while reading fell by about 10 points; science performance did not change significantly on average [4]. OECD described the mathematics decline as unprecedented in the history of PISA and estimated the combined magnitude as equivalent to a substantial fraction of a school year. The deterioration was not uniform: some systems maintained or improved results, while others experienced much larger losses.

It is tempting to interpret the decline as a direct measure of pandemic damage, but the evidence is more complicated. School closures and disruption clearly affected learning opportunities, yet OECD trend analyses show that reading and science performance had already been declining in a number of countries before 2018 [4], [40]. Several systems had also experienced negative mathematics trends before the pandemic. Therefore, COVID-19 should be treated as an important shock interacting with longer-term structural problems rather than as a complete explanation.

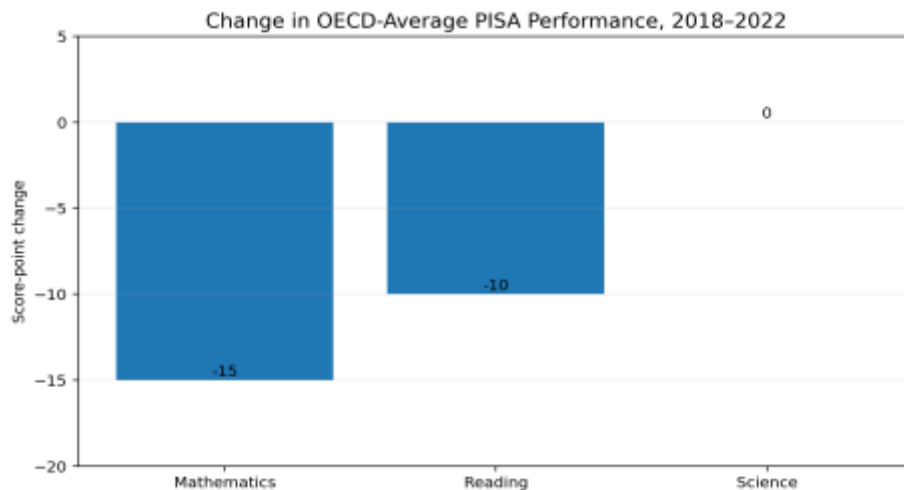


Fig. 6. Change in OECD-average PISA performance between 2018 and 2022. Sources: OECD [4], [40]. Science is shown as approximately zero because the OECD average did not change significantly.



ISSN: 2584-2455

IX. Teacher Capacity: Expansion Requires Human Infrastructure

Every expansion of education ultimately depends on the availability of teachers. Schools can be built rapidly, curricula can be revised by decree and digital platforms can be deployed at scale, but the everyday quality of learning still depends heavily on the competence, time, judgment and relationships of teachers. UNESCO estimates that the world needs approximately 44 million additional primary and secondary teachers by 2030 to achieve universal education goals, including roughly 15 million in sub-Saharan Africa [17].

The shortage is not simply a recruitment problem. Systems must also train, deploy, support and retain teachers. UNESCO has reported a substantial rise in global primary-teacher attrition, from approximately 4.6% in 2015 to 9% in 2022 [18]. Attrition can reflect workload, low pay, limited professional status, weak career progression, difficult working conditions or alternative employment opportunities. When experienced teachers leave, the loss is not limited to headcount; schools also lose accumulated professional knowledge and mentoring capacity.

The quantitative and qualitative dimensions of teacher supply can pull in opposite directions. Rapid hiring may reduce pupil–teacher ratios but weaken average preparation if training systems cannot expand at the same pace. Conversely, highly selective professional standards can improve quality but make shortages harder to resolve. Effective policy therefore needs a workforce strategy that links recruitment with initial training, induction, continuous professional development, leadership and working conditions.

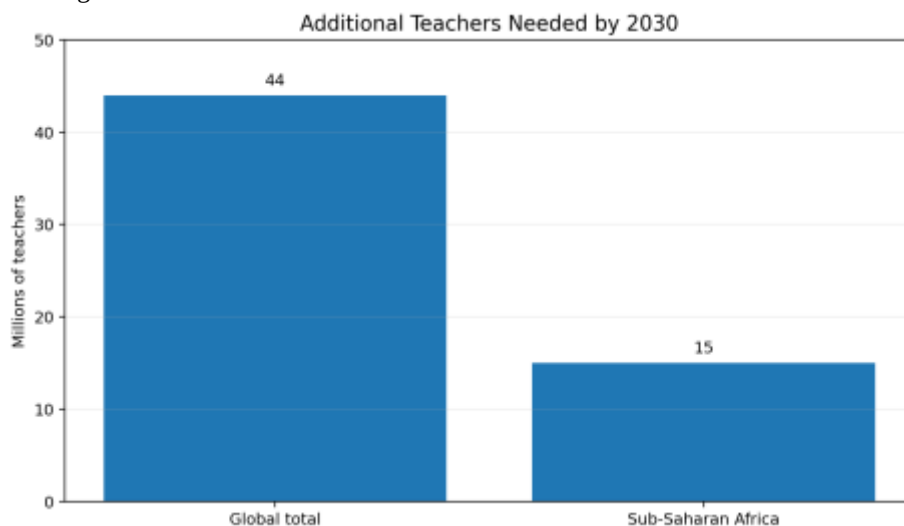


Fig. 9. Approximate long-run expansion of global tertiary participation/gross enrolment. Sources: UNESCO [2], [7]. Values are intended as structural benchmarks rather than a single harmonized annual series



X. Digital Education and the Connectivity Divide

Digital technology has changed the economics of educational information. In a textbook-based system, access to specialized knowledge depended heavily on the resources of the local school or library. Digital networks allow lectures, simulations, research papers, language tools, tutorials and collaborative communities to be distributed at near-zero marginal cost. This has opened important opportunities for remote learning, teacher development, disability access, lifelong education and cross-border knowledge exchange.

However, the potential of digital education is conditional on connectivity. UNICEF and ITU estimated in 2020 that approximately 1.3 billion school-age children aged 3–17—around two-thirds of the global school-age population—did not have internet access at home [16]. The pandemic made the consequences of this inequality immediately visible. When instruction moved online, internet access shifted from a useful supplement to an essential part of effective school infrastructure for many learners.

The digital divide has several layers. The first is physical access to electricity, devices and connectivity. The second is affordability: a household may live within network coverage but be unable to pay for sufficient data or devices. The third is quality: a shared smartphone connection is not equivalent to reliable broadband and a laptop for sustained academic work. The fourth is digital competence. Students and teachers need the ability to search, evaluate sources, protect privacy, communicate safely and use digital tools productively. Finally, access to high-quality content remains uneven across languages and curricula.

For these reasons, digitalization can either reduce or reproduce inequality. A well-designed platform can give a rural learner access to resources that were previously unavailable. The same platform can widen gaps if affluent students have dedicated devices, quiet study environments and adult support while disadvantaged students depend on intermittent mobile access. Educational technology policy should therefore be evaluated in terms of the full learning environment rather than the mere presence of devices. As shown in Fig. 8, the digital divide is also an educational divide because home connectivity determines whether learners can reliably participate in online and technology-supported learning.



ISSN: 2584-2455

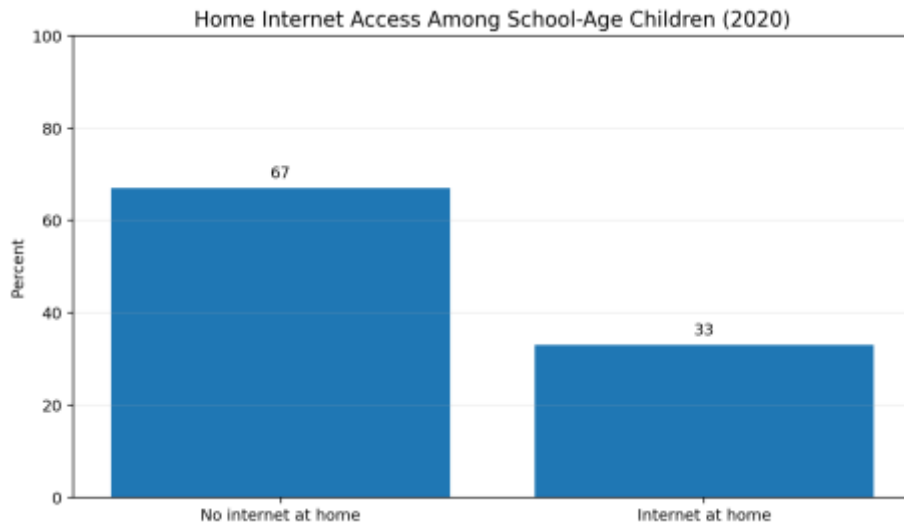


Fig. 8. Home internet access among school-age children, 2020. Source: UNICEF and ITU [16]. The connected share is the complement of the reported two-thirds without home internet

XI. Tertiary Education: From Elite Institution to Mass System

. Tertiary Education: From Elite Institution to Mass System

Higher education has experienced a transformation comparable to the expansion of compulsory schooling, although later in historical time. Around 1970, only about one-tenth of the relevant age cohort participated in higher education globally; contemporary participation exceeds 40% [2], [7]. The change reflects demographic growth, rising secondary completion, expansion of public universities, private higher education, student aid, distance education and the growing role of credentials in professional labour markets.

Martin Trow's distinction among elite, mass and universal-access higher education remains useful for interpreting this transition [10]. Elite systems educate a small minority and can organize institutions around selective academic cultures. Mass systems enroll much larger and more diverse populations, requiring differentiated institutions, new student-support services and broader curricula. Universal-access systems extend participation even further and increasingly blur the boundaries between university education, professional training and lifelong learning.

Massification creates benefits but also new tensions. It expands opportunity and the supply of skilled labour, yet it can generate overcrowding, uneven quality, graduate underemployment and stronger competition among institutions. As participation widens, differences between prestigious universities and less-resourced institutions can become a new form of stratification. The policy question therefore shifts from "how many university places exist?" to "what quality, pathways and outcomes are associated with different forms of tertiary education?"



ISSN: 2584-2455

The expansion also changes the relationship between higher education and the labour market. In an elite system, a degree itself may be a strong signal of scarcity. In a mass system, employers increasingly differentiate among fields, institutions, practical skills and experience. This places pressure on universities to combine disciplinary knowledge with communication, problem solving, digital competence, research literacy and opportunities for applied learning. Fig. 9 illustrates the transformation of higher education from a relatively elite system toward mass participation over the last half-century.

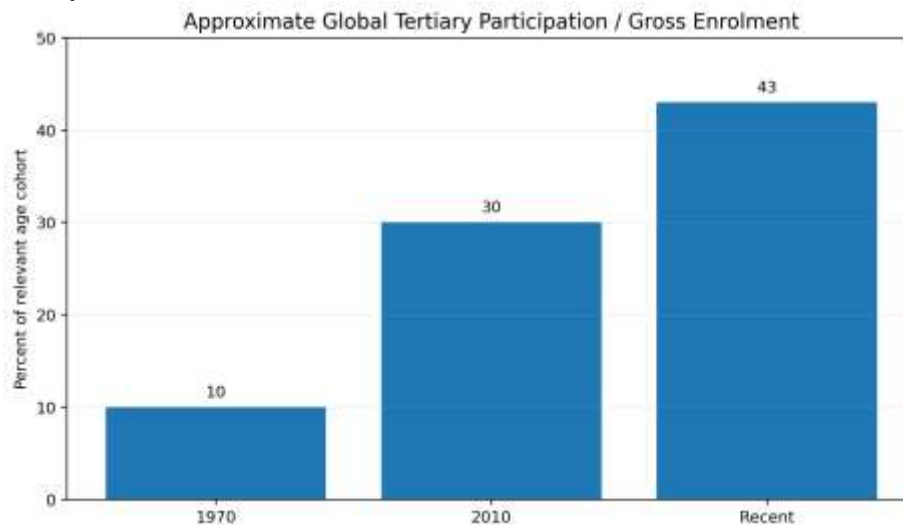


Fig. 9. Approximate long-run expansion of global tertiary participation/gross enrolment. Sources: UNESCO [2], [7]. Values are intended as structural benchmarks rather than a single harmonized annual series

XII. Gender and Socioeconomic Equity

Gender is one of the areas in which global education has changed most visibly. Historically, girls faced systematic restrictions on schooling in many societies. Expansion, legal reform, economic change and social movements have substantially reduced these disparities. Recent SDG reporting indicates that girls now exceed boys in global completion rates by roughly two to three percentage points at primary, lower-secondary and upper-secondary levels [6]. This aggregate reversal is historically significant.

The global average, however, should not be interpreted as the disappearance of gender inequality. Girls continue to face severe barriers in particular conflict-affected, poor and socially restrictive environments, including risks related to early marriage, safety, domestic labour and restrictions on mobility. At the same time, boys experience higher dropout or lower attainment in a number of education systems. The contemporary policy task is therefore more nuanced than simply assuming a universal female disadvantage: it requires identifying who is disadvantaged, at which level, and through which mechanisms in each context.



ISSN: 2584-2455

Socioeconomic inequality is more persistent. The 36% versus 3% out-of-school difference by national income group is one illustration [6], but inequality also exists within countries. Household wealth affects preschool participation, school quality, tutoring, nutrition, connectivity, quiet study space, language exposure and the ability to remain in school when opportunity costs rise. Even where tuition is formally free, indirect costs can be substantial.

The form of inequality also changes as education expands. When primary school becomes nearly universal, social advantage often reappears in access to better schools, advanced tracks, private tutoring, tertiary institutions and international mobility. This means that successful education policy cannot be judged only by equal entry. Equity requires attention to resources, learning outcomes, transitions and the quality of opportunities available at each stage.

XIII. Education Finance: Why Spending Measures Need Context

Education finance is frequently summarized as expenditure as a percentage of GDP or as a share of government spending. These indicators are useful because they show fiscal priority, but they do not by themselves measure adequacy or effectiveness. Two countries can spend the same percentage of GDP on education while having very different amounts of spending per student because their income levels, age structures and enrolment rates differ. A young low-income country may devote a substantial share of national resources to education and still have very limited resources per learner.

For comparative analysis, at least four dimensions should be considered together: education expenditure as a share of GDP, education as a share of total public expenditure, expenditure per student, and the distribution of spending across levels and population groups. Efficiency also matters. Additional spending has greater educational value when it reaches classrooms, supports effective teachers, provides appropriate learning materials and targets constraints that actually limit learning. Spending poorly is not equivalent to investing effectively.

Historical expansion required large capital investments in buildings and teacher payrolls. Contemporary systems face additional expenditure pressures from digital infrastructure, cybersecurity, special education, student mental-health support, school meals, early childhood education and continuous teacher development. AI may create some efficiencies, but it also introduces new costs related to software, data governance, training, evaluation and infrastructure. The fiscal challenge is therefore becoming more complex rather than simply larger.

The economic case for education remains strong. Psacharopoulos and Patrinos, drawing on a large international evidence base, estimate substantial private returns to additional years of schooling, commonly summarized at around 9% per year on average [19]. However, the social value of education extends beyond wages to health, civic participation, innovation and intergenerational outcomes. Financial analysis should therefore avoid reducing education to earnings alone.



XIV. From Knowledge Scarcity to Knowledge Abundance

One of the most fundamental differences between earlier and contemporary education concerns the availability of information. In much of the twentieth century, textbooks, teachers and libraries were major gateways to organized knowledge. Access was constrained by geography, publication costs and institutional resources. The teacher's authority therefore rested partly on control of scarce knowledge and the ability to interpret it for students.

Digital networks altered this relationship. Search engines, open educational resources, online courses, digital libraries, video platforms and collaborative communities dramatically increased the volume of information available to learners. The educational problem changed from obtaining information to navigating abundance. Students now need to judge relevance, credibility, evidence quality and context. Information literacy has therefore become as important as information access.

This does not make memorization or subject knowledge obsolete. Critical thinking is impossible in a vacuum. A learner cannot assess a historical claim without historical knowledge, evaluate a scientific explanation without understanding basic science, or identify an AI hallucination without enough domain expertise to recognize inconsistency. The more abundant information becomes, the more valuable well-organized knowledge can be because it provides the conceptual structure through which new information is interpreted.

The pedagogical implication is a shift in emphasis rather than a rejection of traditional knowledge. Education needs to retain foundational knowledge while giving greater attention to inquiry, problem formulation, source evaluation, synthesis, communication and application. The most productive contrast is therefore not "memorization versus thinking," but "knowledge reproduction alone versus knowledge used for reasoning."

XV. Pedagogy and Assessment: From Standardization Toward More Active Learning

Earlier mass-education systems often relied on standardized curricula and teacher-led instruction because these approaches were administratively efficient at large scale. A single curriculum could be taught to age-graded classes, and examinations could determine progression. Such systems were well suited to the challenge of bringing large populations into formal schooling rapidly, especially when teacher resources and instructional materials were limited.

Contemporary pedagogy increasingly emphasizes active learning, formative assessment, collaboration and application. Constructivist traditions associated with Piaget and Vygotsky provide theoretical foundations for the idea that learners build understanding through interaction, experience and social mediation [11], [12]. Digital tools can support this shift by enabling simulations, immediate feedback and



ISSN: 2584-2455

differentiated tasks. Nevertheless, the effectiveness of any method depends on implementation quality; active learning without structure can be as ineffective as passive lecturing without engagement

Assessment is also under pressure to change. Traditional examinations often reward speed, recall and the production of a final answer under controlled conditions. These functions remain useful for some purposes, but generative AI can now produce essays, explanations and solutions that resemble student work. As a result, assessment increasingly needs to capture the learning process as well as the final product. Oral defence, project work, source logs, iterative drafts, practical demonstrations and supervised application to unfamiliar problems can provide stronger evidence of individual understanding.

The assessment challenge is not simply to prevent misuse of AI. It is to redesign tasks around what education actually values. If a machine can perform a routine operation reliably, students may still need to understand the underlying concept, but they should also learn when to use the tool, how to check it and how to interpret the result. This requires a more explicit separation between foundational competence and tool-assisted performance.

XVI. Artificial Intelligence and the Emerging Educational System

Generative AI differs from earlier educational technology because it does not merely store or transmit content. It can generate explanations, examples, summaries, translations, questions, code, feedback and conversational tutoring in response to user prompts. This makes AI potentially useful across teaching, learning, administration and research. It also means that the technology enters directly into cognitive tasks that were previously performed almost entirely by teachers and students.

The benefits are significant but conditional. AI can provide additional practice, explain a concept in different ways, translate material for multilingual learners, help teachers draft differentiated activities and reduce some administrative burdens. It can also support accessibility through text simplification, speech interfaces and adaptive assistance. In settings with teacher shortages, such tools may extend support between lessons. Yet these advantages depend on accuracy, connectivity, digital literacy and appropriate supervision.

The risks are equally important. Generative systems can produce confident but incorrect information, reproduce biases, expose sensitive data, obscure sources and tempt learners to substitute output generation for genuine learning. Because models optimize plausible responses rather than guaranteed truth, students need enough knowledge to verify claims. UNESCO's guidance therefore emphasizes human-centred governance, privacy, ethical use, age appropriateness and pedagogical validation [20], [39].

AI also changes the meaning of literacy. Earlier schooling emphasized reading, writing and numeracy; the digital era added information and media literacy. The AI era adds the ability to formulate effective questions, understand model limitations, verify outputs, identify bias, protect data and decide which tasks should remain under human



ISSN: 2584-2455

judgment. AI literacy should therefore be treated not as a narrow technical skill but as part of contemporary civic and academic competence.

The most educationally useful model is not “human versus AI” but “human judgment supported by AI.” Students should learn to use intelligent tools while remaining accountable for conclusions. Teachers should be able to use AI without surrendering professional decision-making. Institutions should evaluate systems before large-scale adoption. In this sense, the arrival of AI makes human agency more important, not less, because learners must decide what to ask, what to trust, what to reject and what responsibilities cannot be delegated.

XVII. Integrated Statistical Findings

When the indicators are viewed together, three broad findings emerge. The first is a historic success in access. School participation has expanded enormously since 1950, completion has continued to rise, and tertiary participation has multiplied several times. The second is a persistent distribution problem. Hundreds of millions remain out of school, and exclusion is concentrated in low-income and conflict-affected settings. The third is a quality problem: learning poverty remains widespread, while PISA data show that even well-resourced systems can experience declining performance.

The indicators can also be interpreted as a sequence of bottlenecks. Earlier systems were constrained primarily at the access stage. As access improved, the bottleneck moved to completion. When completion rises, learning quality becomes more visible. Once foundational learning improves, the challenge shifts further toward capability, relevance and application. Countries therefore occupy different positions along the same chain, and global education policy must accommodate these different stages rather than prescribe one universal reform.

Table II. Evidence Matrix: Access, Completion, Learning And Equity

Dimension	Evidence	What the statistic shows	What it does not show
Access	47% ages 5–14 enrolled in 1950; ~90% primary-age participation today	Massive long-run expansion	Does not measure learning quality.
Completion	88/78/60% primary/lower/upper secondary in 2024	Persistence improves with level but remains incomplete	Does not explain why learners leave.
Exclusion	272 million out of school; 36% low-income vs 3% high-income	Large concentration of disadvantage	Does not isolate conflict, poverty or demographic causes.



ISSN: 2584-2455

Learning	70% learning poverty in LMICs	Schooling has not guaranteed foundational literacy	Not a measure of all skills or all countries.
PISA	–15 math; –10 reading, 2018–2022 OECD average	Recent learning decline in participating systems	Does not establish a single causal explanation.
Teachers	44 million additional teachers required by 2030	Human-resource constraint on universal quality education	Does not by itself measure teacher effectiveness.
Connectivity	~67% of school-age children lacked home internet in 2020	Digital learning opportunity was highly unequal	2020 snapshot; access has continued to evolve.

XVIII. Policy Implications

First, education systems should report access, completion and learning together. A ministry that celebrates enrolment growth without measuring foundational learning risks confusing participation with educational success. Dashboards should therefore connect administrative data with reliable learning assessments and disaggregate results by income, gender, geography, disability and other relevant dimensions.

Second, the remaining exclusion requires targeted rather than purely universal policy. When out-of-school rates differ by a factor of twelve between low- and high-income country groups, the final stages of universalization will not be achieved simply by continuing the same policies that expanded enrolment earlier. Cash transfers, school meals, safe transport, flexible schedules, disability support, conflict-sensitive provision and community-based approaches may be necessary depending on the barrier.

Third, foundational learning should be protected as the base of the education system. Curriculum reform is unlikely to succeed if students reach later grades without secure literacy and numeracy. Diagnostic assessment, structured support, appropriate pacing and teacher development can help systems teach at the level students actually need rather than at the level assumed by an overloaded curriculum.

Fourth, teachers should be treated as core infrastructure. The projected 44-million teacher requirement is a warning that technology cannot compensate for a weak profession. Governments need recruitment strategies, sustainable compensation, high-quality preparation, mentoring and career pathways. Digital tools should be evaluated by whether they make teachers more effective and reduce low-value workload without weakening professional autonomy.

Fifth, connectivity should be recognized as an equity issue. Where homework, resources and teacher communication depend on digital platforms, lack of home access becomes a learning disadvantage. Public policy may therefore need to consider device



ISSN: 2584-2455

access, broadband affordability, school connectivity and community access alongside conventional school infrastructure.

Sixth, assessment should evolve for an AI-rich environment. Institutions should identify which competencies must be demonstrated independently and which can legitimately be demonstrated with tools. High-stakes tasks may require supervised components, oral explanation or process evidence, while other assignments can explicitly test the ability to use AI critically and transparently. The objective should be evidence of learning, not the preservation of old assessment formats for their own sake.

Finally, education policy needs a broader definition of success. Employment outcomes matter, but education also develops judgment, civic capacity, ethical reasoning, creativity, communication and the ability to continue learning. In a period of technological uncertainty, adaptability itself becomes an important educational outcome. A resilient system prepares learners not merely for a known job but for continued development across a changing life course.

XIX. A Proposed Education 4.0 Model

The historical evolution identified in this study can be summarized through four overlapping models. Education 1.0 is primarily a knowledge-transmission model in which the teacher is the central source of organized information. Education 2.0 is the mass-schooling model, in which standardized institutions and curricula extend education to large populations. Education 3.0 is networked and digital, connecting learners to online resources, peers and flexible modes of delivery. Education 4.0 is an emerging human-AI collaborative model in which learners, teachers and intelligent systems interact within a global information environment.

The model should not be interpreted as a simple chronological ladder in which each new stage replaces the previous one. All four coexist. A school may use AI tools while still relying on highly standardized examinations; another may use active pedagogy without reliable internet access. A low-income rural region may still face Education 2.0 problems of school supply, whereas a university in a high-income country may be confronting Education 4.0 questions about AI assessment and research integrity.

The analytical value of the model lies in identifying how the core scarcity changes. Education 1.0 operates under scarce organized knowledge. Education 2.0 addresses scarce institutional access. Education 3.0 reduces scarcity of information and connectivity. Education 4.0 increasingly confronts scarcity of attention, judgment, trust and human guidance. As machines become better at generating information, the human capacity to evaluate and apply information becomes a more central educational objective

Table Iii. Evolution Of Educational Systems: Education 1.0 To Education 4.0

Model	Dominant condition	Teacher role	Student role	Main policy problem
-------	--------------------	--------------	--------------	---------------------



ISSN: 2584-2455

Education 1.0	Knowledge scarcity	Primary transmitter	Recipient/apprentice	Access to organized knowledge
Education 2.0	Mass institutional expansion	Instructor in standardized system	Participant in age-graded schooling	Universal access and completion
Education 3.0	Digital abundance	Facilitator and designer	Connected learner	Digital inclusion and quality
Education 4.0	AI-assisted cognition	Mentor, expert and verifier	Creator, evaluator and collaborator	Human judgment, capability and responsible AI use

XX. Limitations and Directions for Future Research

The present study has several limitations. First, global educational statistics are not equally complete across time. Historical datasets have less consistent coverage, especially for countries that gained independence, experienced conflict or lacked statistical systems. Second, indicator definitions change. A historical enrolment figure for ages 5–14 cannot be treated as perfectly equivalent to a contemporary primary-age indicator. For this reason, the paper uses such comparisons to demonstrate structural change rather than to calculate a precise causal trend.

Third, global and income-group averages conceal national variation. PISA covers participating countries and economies rather than the entire world, and its 15-year-old sample does not measure early literacy or adult skills. Learning poverty focuses on reading around age ten and therefore captures an essential but incomplete dimension of education. Digital-connectivity figures from 2020 are especially shaped by the pandemic period and should be updated as new household data become available.

Fourth, the paper is descriptive and comparative rather than causal. The fact that learning declined during a period of digital expansion does not imply that technology caused the decline. Similarly, higher public spending does not guarantee stronger outcomes, but this does not mean that spending is unimportant. Establishing causal effects requires country-level designs, longitudinal data, experiments or credible quasi-experimental methods.

Future research should therefore move in three directions. The first is country-level longitudinal analysis that links access, expenditure, teacher characteristics and learning outcomes. The second is distributional analysis examining how educational change affects learners across income, gender, location and disability. The third is rigorous evaluation of AI-supported education, including randomized or quasi-experimental studies that measure not only short-term task performance but retention, transfer, independence, critical thinking and equity.



ISSN: 2584-2455

XXI. Conclusion

The global education system has changed more profoundly than a simple comparison of old and modern classrooms suggests. In the middle of the twentieth century, access itself was the dominant constraint: a large share of children were outside formal schooling, secondary education was selective and higher education remained largely elite. Over subsequent decades, states and societies built one of the largest institutional expansions in modern history. School participation approached universality in many regions, completion improved, higher education became a mass system and digital networks expanded the reach of educational resources.

The statistical record nevertheless prevents a simple narrative of uninterrupted progress. In 2024, 272 million children and youth were still out of school [6]. The low-income-country out-of-school rate was twelve times the high-income-country rate. In 2022, learning poverty was estimated at 70% in low- and middle-income countries [3]. OECD systems experienced historically large declines in mathematics and reading between 2018 and 2022 [4]. UNESCO estimates that 44 million additional teachers are needed by 2030 [17]. The digital transition has created new possibilities, but the 2020 connectivity evidence showed that two-thirds of school-age children lacked home internet [16].

Taken together, these findings suggest that the main educational challenge has shifted from scarcity of places toward the quality and distribution of capability. The twentieth-century question was largely whether children could enter school. The contemporary question is whether they remain, learn, develop transferable capabilities and gain equitable access to the resources required for continued learning. For some countries, both questions remain active at the same time.

Artificial intelligence adds urgency to this transition. When information and routine outputs can be produced instantly, education must give greater attention to understanding, verification, judgment, creativity, ethical reasoning and the ability to formulate meaningful problems. This does not eliminate the need for knowledge; it raises the value of well-organized knowledge because learners need a foundation from which to judge machine-generated information.

The future of education is therefore unlikely to be defined by a choice between teachers and technology. More plausibly, successful systems will combine universal access, strong foundational learning, well-supported teachers, equitable digital infrastructure and responsible use of intelligent tools. The decisive measure of progress will not be how technologically advanced a school appears, but whether learners leave education better able to understand the world, act responsibly within it and continue learning as that world changes



ISSN: 2584-2455

References

1. UNESCO, "Education: What you need to know and why it matters," Paris, France, 2026.
2. UNESCO, Higher Education Global Data Report: Working Document. Paris, France, 2022.
3. World Bank, UNESCO, UNICEF, FCDO, USAID, and Bill & Melinda Gates Foundation, "70% of 10-year-olds now in learning poverty, unable to read and understand a simple text," Jun. 23, 2022.
4. OECD, PISA 2022 Results (Volume I): The State of Learning and Equity in Education. Paris, France: OECD Publishing, 2023.
5. United Nations, Universal Declaration of Human Rights. New York, NY, USA, 1948.
6. United Nations, The Sustainable Development Goals Report 2025, Goal 4: Quality Education. New York, NY, USA, 2025.
7. UNESCO, Global Education Monitoring Report 2024/5: Leadership in Education—Lead for Learning. Paris, France, 2024/2025.
8. UNESCO Institute for Statistics, "UIS Education Data," Montreal, Canada.
9. World Bank, "World Development Indicators: Education statistics," Washington, DC, USA.
10. M. Trow, "Reflections on the transition from elite to mass to universal access: Forms and phases of higher education in modern societies since WWII," in International Handbook of Higher Education, J. J. F. Forest and P. G. Altbach, Eds. Dordrecht, The Netherlands: Springer, 2007, pp. 243–280.
11. J. Piaget, The Psychology of Intelligence. London, U.K.: Routledge, 1950.
12. L. S. Vygotsky, Mind in Society: The Development of Higher Psychological Processes. Cambridge, MA, USA: Harvard University Press, 1978.
13. OECD, PISA 2022 Results (Volume II): Learning During—and From—Disruption. Paris, France: OECD Publishing, 2023.
14. United Nations, "Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all," UN Department of Economic and Social Affairs.
15. UNESCO, Global Education Monitoring Report: Gender Report. Paris, France: UNESCO.
16. UNICEF and International Telecommunication Union, How Many Children and Young People Have Internet Access at Home? Estimating Digital Connectivity During the COVID-19 Pandemic. New York, NY, USA, 2020.
17. UNESCO and International Task Force on Teachers for Education 2030, Global Report on Teachers: Addressing Teacher Shortages and Transforming the Profession. Paris, France, 2024.
18. UNESCO Institute for Statistics and International Task Force on Teachers for Education 2030, "Global teacher shortage projections and teacher attrition indicators," Paris, France, 2024.
19. G. Psacharopoulos and H. A. Patrinos, "Returns to investment in education: A decennial review of the global literature," Education Economics, vol. 26, no. 5, pp. 445–458, 2018.
20. F. Miao and W. Holmes, Guidance for Generative AI in Education and Research. Paris, France: UNESCO, 2023.



ISSN: 2584-2455

21. UNESCO, “UNESCO survey: Less than 10% of schools and universities have formal guidance on AI,” Paris, France, Jun. 2023.
22. UNESCO, *Reimagining Our Futures Together: A New Social Contract for Education*. Paris, France, 2021.
23. World Bank, *World Development Report 2018: Learning to Realize Education’s Promise*. Washington, DC, USA: World Bank, 2018.
24. R. J. Barro and J. W. Lee, *Education Matters: Global Schooling Gains from the 19th to the 21st Century*. Oxford, U.K.: Oxford University Press, 2015.
25. J.-W. Lee and H. Lee, “Human capital in the long run,” *Journal of Development Economics*, vol. 122, pp. 147–169, 2016.
26. E. A. Hanushek and L. Woessmann, *The Knowledge Capital of Nations: Education and the Economics of Growth*. Cambridge, MA, USA: MIT Press, 2015.
27. E. A. Hanushek and L. Woessmann, “The role of cognitive skills in economic development,” *Journal of Economic Literature*, vol. 46, no. 3, pp. 607–668, 2008.
28. C. Goldin and L. F. Katz, *The Race Between Education and Technology*. Cambridge, MA, USA: Harvard University Press, 2008.
29. D. H. Autor, “Skills, education, and the rise of earnings inequality among the ‘other 99 percent’,” *Science*, vol. 344, no. 6186, pp. 843–851, 2014.
30. G. Siemens, “Connectivism: A learning theory for the digital age,” *International Journal of Instructional Technology and Distance Learning*, vol. 2, no. 1, pp. 3–10, 2005.
31. OECD, *Education at a Glance 2024: OECD Indicators*. Paris, France: OECD Publishing, 2024.
32. UNESCO, *Global Education Monitoring Report 2023: Technology in Education—A Tool on Whose Terms?* Paris, France, 2023.
33. International Telecommunication Union, *Facts and Figures 2023*. Geneva, Switzerland, 2023.
34. World Bank, UNESCO, and UNICEF, *The State of the Global Education Crisis: A Path to Recovery*. Washington, DC, Paris, and New York, 2021.
35. UNESCO, UNICEF, World Bank, and OECD, *From Learning Recovery to Education Transformation: Insights and Reflections from the 4th Survey of National Education Responses to COVID-19 School Closures*. 2022.
36. R. Luckin, W. Holmes, M. Griffiths, and L. B. Forcier, *Intelligence Unleashed: An Argument for AI in Education*. London, U.K.: Pearson, 2016.
37. W. Holmes, M. Bialik, and C. Fadel, *Artificial Intelligence in Education: Promises and Implications for Teaching and Learning*. Boston, MA, USA: Center for Curriculum Redesign, 2019.
38. UNESCO, *Recommendation on the Ethics of Artificial Intelligence*. Paris, France, 2021.
39. United Nations, *Transforming Our World: The 2030 Agenda for Sustainable Development*. New York, NY, USA, 2015.
40. OECD, “Decline in educational performance only partly attributable to the COVID-19 pandemic,” Dec. 5, 2023.