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RETHINKING EDUCATION AS THE SOLE PREREQUISITE FOR NATIONAL DEVELOPMENT IN 21ST-CENTURY ASIA

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Abstract

This article critically re-evaluates the conventional assumption that formal education is the singular prerequisite for national development, specifically in diverse 21st-century Asian contexts. Employing a comprehensive narrative literature synthesis of cross-disciplinary peer-reviewed research published from 2001 onwards, the study integrates foundational theoretical frameworks—such as human capital and capabilities approaches—with contemporary empirical evidence. The rigorous analysis reveals that while education undoubtedly remains a vital driver of societal progress, its transformative impact is profoundly contingent on instructional quality, labor-market relevance, robust institutional governance, and complementary resources such as digital and entrepreneurial ecosystems. Furthermore, compelling evidence from various Asian nations demonstrates that substantial developmental gains are achievable through alternative pathways, including strategic infrastructure investments, resource management, and targeted e-government reforms, even when aggregate educational attainment is moderate. Ultimately, the findings challenge linear developmental models and strongly advocate for a nuanced, context-sensitive policy approach. Rather than pursuing schooling in isolation, policymakers must prioritize building coherent ecosystems that seamlessly harmonize diverse learning opportunities with industrial innovation, thereby fostering a holistic, inclusive, and sustainable trajectory for national progress.

Keywords: National Development Pathways, Educational Governance, Human Capital Theory, Asian Economic Growth, 21st-Century Skills

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Introduction

Education remains a critical factor in national development, shaping human capital and a range of cognitive and non-cognitive skills crucial to productivity, governance, and social resilience. In the 21st century, however, the relationship between educational attainment, quality, and national development has become increasingly nuanced. The transition toward a knowledge economy, coupled with rapid technological changes and shifting demographic trends, demands more than simply increasing years of schooling; it necessitates the cultivation of 21st-century skills and a closer alignment of education with labor-market needs and robust governance frameworks (Krayneva et al., 2021; Tabroni et al., 2022). This complexity raises a central and pressing question: To what extent is education an indispensable factor—rather than simply a beneficial correlate—in achieving sustainable national development in the 21st century? Specifically, does a high level of educational attainment and quality constitute a mandatory precursor to advanced development, or can nations effectively navigate alternative pathways by leveraging strategic governance, technological innovation, or other assets to achieve comparable progress? This question hinges on two intertwined propositions debated across various academic fields, including economics and education. Firstly, education is vital as it cultivates human capital and foundational skills that enable individuals to generate value and engage effectively in complex institutional settings that foster development (Vodenko, 2019; Tabroni et al., 2022). Secondly, education alone does not guarantee success; development outcomes are also dependent on governance quality, institutional integrity, and the alignment of education with national goals and labor-market structures. It is increasingly recognized that the effects of education on development are moderated by factors such as curriculum relevance and teacher effectiveness, as well as the broader governance structures that facilitate the translation of educational outcomes into societal benefits (Howard et al., 2019; Weeks et al., 2020; Bagova et al., 2021; Mets et al., 2023).

This article aims to synthesize 21st-century (2001-present) literature to explore the complex relationship between education and national development. It engages theoretical frameworks that link education to development, including human capital and capabilities approaches, and evaluates empirical findings regarding causality at macro, meso, and micro levels. The synthesis considers contexts in which education is not the exclusive prerequisite for development, and where alternative drivers such as innovation and governance can lead to positive outcomes. The article draws on a range of peer-reviewed literature to illustrate how well-designed educational systems can support economic growth and social cohesion, while recognizing that development can occur under varying educational configurations.

Methodologically, this article employs a narrative literature synthesis that spans 2001 to the present across several disciplines. Unlike a strict meta-analysis, the aim is to seamlessly integrate theoretical and empirical insights to elucidate the mechanisms linking education to development, identify varying contexts in which this link is strongest, and discuss alternative development pathways. The foundational concepts emphasized by the referenced works include: the importance of 21st-century skills and ICT-enabled pedagogy; the crucial role of teachers in realizing education's potential for development; the necessity of coherent policy frameworks that connect education to broader societal goals; and an understanding that education's contribution to development is context-dependent.

To structure the argument, the article is divided into four sections following this introduction. Section 2 discusses the theoretical foundations and conceptual frameworks that identify education as a developmental driver while addressing ongoing debates about causality and the necessary conditions for successful outcomes. Section 3 explores empirical evidence linking education to development, focusing on intervention studies that highlight the impact of education on learning gains and broader social effects, as well as methodological considerations for causal inference. Section 4 presents cases illustrating that development can

be achieved through various channels—such as governance reform, entrepreneurship-focused education, and policies that prioritize educational equity and relevance. Finally, Section 5 synthesizes key findings, discusses policy implications, and suggests avenues for further research to address cross-country differences and integrate educational outcomes with measurable development goals.

This inquiry adopts a broad definition of development, encompassing economic growth, human development, and innovation within the contemporary global economy. It frames education as both a potential driver of development and a contextual factor deeply influenced by governance, institutions, and complementary resources such as technology and entrepreneurship. Ultimately, this article argues that while education is undeniably vital, its transformative power hinges on quality, relevance, and a supportive ecosystem that enables individuals to leverage their skills for sustained national progress; it is not a standalone solution.

Theoretical Foundations for Education as a Pathway to Development in the 21st Century

Theoretical Explanation of the Education-Development Link

The education-development nexus rests on two complementary theoretical pillars: human capital theory and endogenous growth theory. In the first strand, education expands the stock of capabilities within individuals—cognitive skills such as problem-solving and numeracy, and non-cognitive dispositions like perseverance, creativity, and collaboration—which collectively raise productivity and earnings, thereby contributing to broader economic and social development (Krueger & Lindahl, 2001; Uansa-ard et al., 2025). This framing is reinforced by cross-country work showing that higher educational attainment and improved schooling quality correlate with stronger growth performance and structural transformation, albeit with substantial heterogeneity across contexts (Permani, 2009; Oancea et al., 2017). The second pillar emphasizes that growth results from knowledge creation, diffusion, and institutional capabilities; education shapes the capacity to generate, absorb, and deploy new technologies, which in turn fuels innovation-driven development in knowledge-based economies (Sredojević et al., 2016). Taken together, these theories explain why education is consistently identified as a foundational input in long-run development trajectories, while simultaneously signaling that institutional settings and policy design mediate the connection.

Crucially, the education-development link is not a mechanical, one-way causal chain. The macroeconomic payoff of education crucially depends on how well schooling quality translates into productive capabilities and how effectively those capabilities are mobilized within the economy. Empirical analyses highlight that the impact of education on growth is heavily context-dependent and conditional on the economy's absorptive capacity, the sectoral composition of growth, and the presence of complementary policies (e.g., fiscal, monetary, and industrial policies) that foster investment in human capital and its productive uses. Moreover, if education investments are skewed towards credentialing without demonstrable skill gains or if graduates face structural barriers to labor market entry, the developmental impact can be significantly diminished (Basu & Bhattarai, 2012). Conversely, settings with policy coherence and strategic investment in human capital—often accompanied by governance reforms and labor-market alignment—tend to exhibit more pronounced development payoffs from educational investments (Plummer & Taylor, 2004; Permani, 2009).

A forward-looking dimension of the theory emphasizes the quality and relevance of education for a modern economy. The shift toward 21st-century skills—such as critical thinking, collaboration, digital literacy, and adaptive problem-solving—reframes education as a capability-building enterprise rather than a mere credentialing process. Empirical and policy-oriented work across the last two decades links the development payoff to the ability of

education systems to embed these competencies through teacher quality, curricula reform, and ICT-enabled pedagogy, all within coherent governance structures that connect schooling with labor-market needs and national development objectives (Taylor & Plummer, 2003; Plummer & Taylor, 2004; Howard et al., 2019). In short, "education builds people, and people build nations" (Phucharoen, 2021). However, the strength of this linkage depends on whether the education system is designed, funded, and governed to cultivate relevant skills and to translate learning into productive economic and social activities (Krueger & Lindahl, 2001; Permani, 2009).

Finally, the literature acknowledges that the education-growth relationship may exhibit nonlinearity and varying trajectories across countries and stages of development. Some regions experience diminishing marginal returns to additional schooling without complementary structural reforms or sectoral upgrading. At the same time, other contexts realize outsized benefits from targeted investments in tertiary education tied to high-growth sectors (e.g., technology, manufacturing, services) and entrepreneurship ecosystems (Plummer & Taylor, 2004; Márquez-Ramos & Mourelle, 2019). This nuanced theoretical picture supports the article's central claim: education is a crucial, often necessary input for development but not a universal, stand-alone prerequisite; its developmental value is realized only within a broader ecosystem of governance, policy alignment, and transformative capacity (Mônica & Tache, 2016; Howard et al., 2019).

Mechanisms and Channels Through Which Education Affects Development

The education-development relationship operates through a constellation of interlocking mechanisms, each amplifying or moderating the impact of schooling on national outcomes. Foremost among these is the human-capital channel: education expands both cognitive capabilities (e.g., problem solving, numeracy, conceptual comprehension) and non-cognitive dispositions (e.g., persistence, creativity, collaboration) that collectively raise productivity and earnings, contributing to broader development trajectories. Robust cross-country research shows that higher educational attainment and improved schooling quality are associated with stronger growth and structural transformation, albeit with important heterogeneity across contexts and policy settings (Bloom et al., 2021). The nonlinearities documented in several studies further remind us that the marginal development payoff of additional schooling depends on the surrounding economic structure and the presence of complementary reforms.

A parallel but distinct channel operates through labor-market dynamics and productivity amplification. Education enhances employability, facilitates better job matching, and raises firm-level output when skills align with the demands of modern production and service sectors. For example, countries that have strategically invested in STEM education alongside policies that incentivize technology transfer have seen a marked increase in innovation and the creation of high-skill jobs. Here, the interaction between human capital and absorptive capacity—how readily an economy can adopt, adapt, and diffuse new technologies—shapes the scale of development payoffs. Empirical work indicates that returns to schooling on growth are conditional on labor-market demand, governance quality, and policy coherence; when curricula and labor-market signals are well aligned, educational investments yield more substantial productivity gains and faster economic upgrading (Bloom et al., 2021). Entrepreneurial activity can serve as a bridge between schooling and growth, with human capital and entrepreneurial flair jointly driving local and regional development, especially in contexts where policy and market conditions foster new venture creation (Gao & Xiao, 2022).

Innovation and technological diffusion constitute another critical channel. Education equips individuals with the capabilities required to generate, absorb, and deploy new knowledge, which underpins innovation ecosystems and knowledge-based growth. This mechanism is reinforced by evidence that higher levels of education interact with technology policy and industry structure to accelerate productivity advances and the diffusion of best practices (e.g.,

in ICT-enabled sectors and high-growth industries). Contemporary discussions of Education 4.0 and 21st-century skill frameworks further emphasize that the ability to innovate hinges on integrating advanced curricula, digital literacies, and adaptive problem-solving within strong governance and industry linkages (Suksai et al., 2021; González-Pérez & Soledad, 2022).

The quality and governance of education act as enabling channels that determine whether learned capabilities translate into development outcomes. Teacher quality, professional development, and ICT-enabled pedagogy magnify the payoff of educational inputs by increasing learning gains and the acquisition of transferable competencies critical in the modern economy (Hu, 2023). When these pedagogical improvements are supported by coherent policy frameworks and alignment with labor-market needs, schools become engines of productive capacity rather than mere credential unlockers.

Finally, alternative pathways—such as targeted entrepreneurship education, micro-credentials, and digitally mediated learning—offer additional channels through which education can stimulate development, sometimes compensating for lower levels of traditional schooling or transient declines in formal schooling. Empirical work on entrepreneurship education and related competitions demonstrates how experiential learning and policy incentives can strengthen entrepreneurial competencies and intent, contributing to local economic transformation even in settings where conventional schooling outputs are modest (Gao & Xiao, 2022; Mhichíl et al., 2023). Across these channels, the evidence converges on a nuanced conclusion: education matters for development through multiple, interacting mechanisms, and the magnitude of its effect is conditioned by governance, labor-market structure, industry context, and the availability of complementary inputs such as technology and entrepreneurial ecosystems (Bloom et al., 2021).

Contextual Boundaries, Quality Versus Quantity, and Potential Misalignments

The education-development link is bounded by context, and its strength hinges as much on quality and alignment as on the sheer quantity of schooling. Cross-country evidence consistently shows substantial heterogeneity: rising enrollment does not automatically translate into sustained development if learning outcomes, relevance, and governance are weak or misaligned with national priorities (Permani, 2009). Nonlinearities in the education-growth relationship imply that additional schooling yields diminishing or contingent returns unless accompanied by complementary reforms and absorptive capacity within the economy (Oancea et al., 2017). In such settings, a policy that incentivizes more years of schooling without improving instructional quality or relevance risks crowding out productive investments and misallocating scarce resources (Basu & Bhattarai, 2012). This is not a challenge confined to low-income countries; even advanced economies can experience suboptimal development payoffs when the quality of schooling and the coherence of systems lag evolving labor-market demands (Permani, 2009).

Quality matters as much as quantity. Teacher quality, professional development, and the integration of ICT-enabled pedagogy significantly amplify the upfront inputs in education, producing learning gains that translate into transferable competencies, productivity, and capacity for innovation (Habets et al., 2020). When curricula are refreshed to embed 21st-century skills—critical thinking, collaboration, digital literacy, and adaptive problem-solving—within coherent governance frameworks that connect schooling to labor-market needs, the developmental payoffs are greater and more enduring (Hidayatullah et al., 2021). In contrast, heavy emphasis on credentialing without corresponding improvements in pedagogy or alignment with labor-market signals can generate a superficial-gains narrative that fails to sustain growth or competitiveness (Basu & Bhattarai, 2012). Empirical work on higher education and employability reinforces this: graduates' skills development and labor-market readiness mediate the relationship between education and economic outcomes, underscoring

that quality improvements reinforce growth channels such as productivity and innovation (Mahmud & Wong, 2022).

Contextual boundaries also arise from structural and policy misalignments. When education reforms operate in silos—without coordinated fiscal, industrial, and governance policies—the potential for education to catalyze development weakens. Studies show that when policy coherence, investment in human capital, and industry linkages are strong, education exerts a more pronounced effect on economic growth and upgrading; where these conditions are weak, the same level of schooling may yield modest or even negligible development gains (Permani, 2009). This critique is not limited to macroeconomic indicators: at the tertiary level, the risk of misalignment between graduates' skills and the job market's needs can dampen the growth benefits and erode the social legitimacy of reforms (Habets et al., 2020). Even within countries, regional disparities in quality and access—such as urban-rural divides and digital divides—can exacerbate inequality in development outcomes, highlighting the equity dimension of the education-development nexus (Berg et al., 2021).

Alternative pathways and modalities illuminate the quality-quantity dynamic. In some contexts, digitally mediated and open education (e.g., MOOCs, online modules) can expand access to high-quality learning and credentialing where formal systems fall short, thereby supporting development gains without requiring universal increases in traditional schooling lengths (Sukriono & Sudirman, 2020). Likewise, entrepreneurship-oriented education and integrated STEM approaches can generate productive capabilities even when traditional schooling is uneven, by fostering innovation ecosystems and local economic transformation (Arafat et al., 2024). These findings suggest that a diversified portfolio of learning opportunities—combining high-quality formal schooling with flexible, policy-aligned, and market-responsive non-formal options—may better support development across heterogeneous settings.

Finally, measurement and accountability remain central to validating the quality narrative. The field increasingly recognizes the challenge of assessing 21st-century skills across contexts, reinforcing the need for robust, multidimensional evaluation frameworks that capture cognitive and non-cognitive outcomes, learning processes, and applied competencies in addition to conventional test scores (Long et al., 2024). Such assessments are essential to ensure that increases in schooling translate into genuine capabilities that underpin development, rather than merely higher credential counts (Illene et al., 2023).

In sum, education contributes to development most effectively when quality, relevance, and governance are aligned with labor-market and innovation priorities, and when delivery incorporates multiple pathways that extend beyond traditional schooling. To visually synthesize these theoretical dimensions, Figure 1 presents a conceptual framework contrasting the traditional linear education-development model with the complex, multi-pathway ecosystem necessary for 21st-century progress. The central takeaway is not simply "more schooling," but "better schooling within a coherent ecosystem"—augmented by alternative pathways such as inclusive e-government, ICT-enabled platforms, and strategic resource management—that translates learning into productive economic and social outcomes.

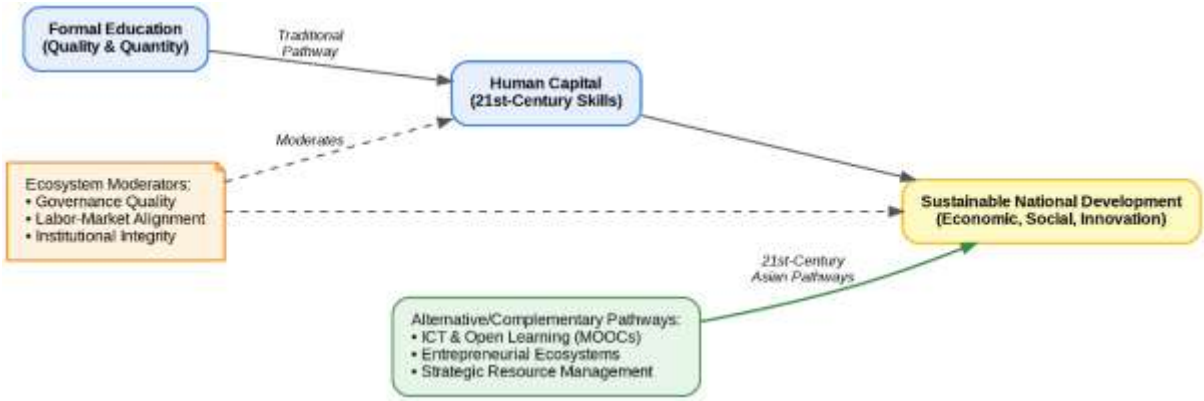

Figure 1 Conceptual Framework of 21st-Century National Development Pathways in Asia

Does Education Causally Drive Development? Empirical Evidence Across Pathways

Empirical Data Suggesting Causal Effects from Education to Development (Macro- and Meso-Level Pathways)

A substantial strand of the empirical literature treats education as a driver of development by shaping the stock of human capital and an economy's capacity to innovate and upgrade. At the macro level, robust cross-country evidence indicates that higher educational attainment and better-quality schooling are associated with faster growth and more rapid structural transformation, although the strength of the link varies across contexts and policy environments (Permani, 2009; Oancea et al., 2017). Krueger and Lindahl (2001) synthesize microeconomic evidence on individual outcomes with macro growth analyses, arguing that education exerts an important causal influence on earnings and, in many settings, on growth when measurement issues are addressed; they also show that the macro connection is conditional on institutional and policy factors, thereby explaining why schooling alone does not guarantee uniform development gains. This cautions against interpreting the education-growth nexus as a simple, universal rule.

Cross-country examinations reinforce the conditional and context-dependent nature of the education-growth relationship. Oancea, Pospíšil, and Drăgoescu (2017) compare the Czech Republic and Romania to document a positive link between higher education and economic growth, suggesting a direct causal channel from educational inputs to macro performance in this regional European context. Similarly, Permani (2009) surveys East Asia and finds that education contributes to growth only when complemented by governance, market efficiency, and sectoral upgrading, emphasizing that education amplifies growth when embedded in a conducive development regime rather than acting in isolation.

The existence of nonlinearities in the education-growth relationship has gained prominence in the literature. Márquez-Ramos and Mourelle (2019) demonstrate that the impact of education on growth exhibits nonlinearities, with returns that vary with a country's level of development, economic structure, and stage of upgrading. This work implies that simply increasing average schooling without strategic alignment to growth-enhancing sectors may yield shifting or even diminishing marginal gains in specific settings. Mônica and Tache (2016) report that tertiary education can have adverse effects on growth in some contexts, underscoring that excessive emphasis on advanced credentials without attention to labor-market relevance can fail to translate into net development benefits.

The issue of policy design is central here. Basu and Bhattarai (2012) show that when government spending on education is biased or misallocated, rising schooling attainment may fail to deliver sustained growth, as these investments do not align with labor-market needs or productivity-enhancing activities. This finding underscores that governance quality and policy

coherence are essential moderators of the education-development channel, a theme echoed across macro studies that emphasize the roles of absorptive capacity, industrial policy, and fiscal governance in translating educational inputs into growth and upgrading.

Taken together, these macro- and meso-level strands provide credible evidence that education can causally influence development—through human capital formation, productivity, and structural upgrading—but only within a well-governed, labor-market-responsive, and technologically adaptive ecosystem. The literature consistently cautions against assuming a universal, monotonic causal path from education to development; instead, it highlights conditional causality shaped by policy design, institutional quality, and complementary investments in technology, governance, and industry linkages.

Empirical Data Illustrating Causal Relationships Through Interventions and Skill-Building (Micro- and Meso-Level Evidence)

A substantial body of micro- and meso-level studies provides credible, quasi-experimental or experimental evidence that well-designed educational interventions can causally improve targeted skills, with implications for broader development outcomes. At the micro level, interventions that explicitly cultivate higher-order thinking and evidence-based reasoning yield measurable gains in students' competencies, which are prerequisites for productive adaptation in complex economies. For example, Engelmann et al. (2022) demonstrate that applying varied, structured learning activities designed to enhance students' critical appraisal of scientific literature leads to meaningful improvements in scientific reasoning and evidence evaluation skills, supporting the causal claim that deliberate instructional design can strengthen core cognitive capabilities essential for innovation and informed decision-making. These findings align with broader literature showing that targeted pedagogy can produce learning gains beyond rote memorization, especially when assessments capture evidence-based reasoning alongside content knowledge.

Parallel micro-level studies highlight the role of social and relational dynamics in translating educational input into learning gains. Bennett & Bratton (2011) report that implementing child-teacher relationship training yields significant reductions in externalizing behaviors and improvements in classroom engagement, signaling that a favorable relational climate is a proximal mechanism by which schooling translates into better learning and developmental trajectories. Similarly, Ball et al. (2023) document that multi-session, trauma-informed relationship education within foster-care contexts enhances youths' relationship skills and prosocial behavior, illustrating how meso-level program design can create environments conducive to skill acquisition and social development, which are foundational for long-run economic and social participation.

Digital and non-traditional modalities further expand the causal chain from education to development. Sukriono and Sudirman (2020) provide evidence that MOOCs in a culturally relevant domain can elevate student performance, illustrating how scalable online learning can causally improve learning outcomes when content is well-designed and accessible, thereby broadening the pipeline of capable graduates across diverse settings. Integrated STEM and Education 4.0 initiatives—encompassing robotics, coding, and digital literacies—have likewise been associated with gains in 21st-century skills and adaptive problem-solving, as shown in systematic reviews and empirical syntheses highlighting programming and ICT-enabled pedagogy as key mechanisms linking schooling to productive capacities. Mhichíl et al. (2023) further note that micro-credentials are credible, flexibly stackable forms of credentialing that can accelerate skilled transitions in labor markets, particularly when aligned with industry needs.

Taken together, micro- and meso-level intervention studies provide convergent evidence that purposefully designed educational experiences—whether in classroom settings, school climates, or policy-informed programs—lead to measurable improvements in cognitive and

non-cognitive skills. These gains, in turn, create the capability and adaptability necessary for productive employment, entrepreneurship, and innovation—central channels through which education supports development. While recognizing that causal impacts are context-dependent and mediated by governance, labor-market alignment, and technology, the accumulating micro- and meso-level evidence substantiates a crucial link in the education-development nexus: quality, targeted skill-building delivered through well-structured interventions can generate tangible developmental benefits beyond the classroom.

Empirical Evidence of Education's Causal Impact on Development in Asia

Asia offers compelling examples of countries in which education functions not merely as a correlate of development but as a causal driver within specific institutional and policy contexts. Across diverse economies, a growing body of micro- and meso-level studies identifies education as a key determinant of growth and structural upgrading, particularly when tempered by governance, labor-market alignment, and targeted skill formation.

Indonesia offers one of the clearest examples in Asia. Amaluddin (2020) analyzes Indonesia using a Panel Vector Error Correction Model (PVECM) framework to examine the poverty-education-growth nexus. The analysis uncovers long-run causal links between education and economic growth, with education responding to and, in turn, influencing growth, while also interacting with poverty dynamics. The results imply that improvements in educational attainment can contribute to sustained growth and poverty reduction, corroborating the view that education is a causal contributor to development when embedded within a broader development regime. This aligns with the broader Indonesian policy emphasis on expanding access to quality schooling as a vehicle for inclusive growth and social mobility.

India provides further evidence of education's causal role in development through country-specific tests of causality. Kotásková et al. (2018) investigate the impact of education on economic growth in India, employing econometric methods to test for Granger causality. Their results indicate a directional causal effect from education to growth, with the magnitude and significance varying across specifications and educational levels. The study highlights that the growth payoff from education is context-sensitive and is amplified when educational quality, curriculum relevance, and labor-market signaling align with growth objectives, consistent with a broader theory of education as a driver of productive capacity.

Malaysia further illustrates how education can causally influence development within an Asian economy characterized by rapid structural transformation. Goh et al. (2020) examine the nexus among education, economic growth, fertility, and female labor supply. Their empirical findings provide evidence of a long-run relationship and, in several specifications, causal linkages from education to growth. The analysis also shows how education interacts with female labor participation, suggesting that education's developmental impact is amplified when female labor supply is actively mobilized and integrated into the economy. This case underscores the importance of gender-responsive education and labor-market integration as channels through which schooling translates into development outcomes.

Nepal contributes another Asia-focused causal narrative. Dahal (2012) conducts a causality analysis linking higher educational enrollment and teacher employment to GDP. The results indicate that education exerts a causal influence on economic output, reinforcing the argument that expanding high-quality schooling and investing in teachers can be an engine of growth even in smaller, developing Asian economies. The Nepal case demonstrates the potential for education-driven growth to operate in settings with limited fiscal space when policy choices prioritize human capital development and effective schooling delivery.

Finally, East Asia as a regional context provides corroborating evidence that education is embedded within a broader growth philosophy. Permani (2009) surveys the role of education in East Asia's growth trajectories, emphasizing complementarity with governance, market development, and sectoral upgrading. Li & Huang (2010) extend this by showing that

education, health, and physical capital jointly contribute to growth in East Asian economies, with education's contribution remaining robust when health and governance factors are favorable. Collectively, these studies illustrate that, in East Asia, education is a causal component of development, primarily within a mature policy ecosystem that fosters knowledge-intensive upgrading and human capital formation.

Taken together, these Asian country cases—the Indonesia PVECM results, India's Granger-causality findings, Malaysia's education-growth-labor-market linkages, Nepal's enrollment-and-GDP causality, and the East Asian literature—offer convergent evidence that education can causally drive development in contexts where it is linked to coherent governance, labor-market signaling, and strategic investments in human capital. They also remind us that the strength and direction of causality are contingent on policy design, implementation quality, and the capacity to translate schooling into productive use. Thus, while education is not a universal prerequisite for development, it can be a powerful causal lever in Asia when embedded within an enabling developmental architecture.

Education Is Not the Sole Gatekeeper: Alternative Pathways and Contextual Moderators of Development

Evidence That Development Can Proceed with Varied or Moderate Education Levels

A growing body of cross-country and within-country evidence demonstrates that development can advance even when the population's formal schooling attainment is not uniformly high. This finding challenges a simplistic, one-size-fits-all view of education as the sole engine of development. It highlights the critical roles of governance, labor-market signaling, and innovative learning modalities in translating educational inputs into growth and human development. In other words, education's developmental payoff can be substantial even when education levels are moderate or uneven, provided the surrounding institutional framework and policy design enable effective use of skills.

First, education may exhibit nonlinear returns that depend on the country's development stage, industrial structure, and the quality of implementation. Márquez-Ramos and Mourelle (2019) show that the relationship between education and growth is not strictly linear: marginal gains from additional schooling can be significant in specific contexts but small or even counterproductive in others when investments are misaligned with growth-enhancing sectors or when absorptive capacity is limited. This nuance implies that moderate levels of schooling, when complemented by selective reforms and upgrading in key sectors, can still yield meaningful development outcomes. Similarly, Basu and Bhattarai (2012) emphasize that government bias in education spending or the misallocation of resources can suppress the growth payoff of rising schooling, underscoring that the same quantity of schooling can have very different effects under different governance arrangements.

Second, macro- and meso-level evidence from Asia and other regions illustrates that development can proceed through combinations of education, governance, and structural upgrading rather than through schooling alone. Permani's (2009) synthesis of East Asian growth contexts stresses that education contributes to growth most powerfully when integrated with strong governance, market efficiency, and sectoral upgrading, rather than acting in isolation. Li and Huang's (2010) cross-country analysis of health and education alongside growth in East Asia further confirms that human-capital investments—when coupled with good health, sound institutions, and fiscal competence—support productivity and growth, even if schooling alone is not the sole driver. Indonesia offers a concrete illustration: a panel-structure analysis finds long-run causal links among poverty reduction, educational improvements, and growth within a broader development regime, indicating that educational advances reinforce development when embedded in complementary policies (Amaluddin, 2020). Malaysia adds another facet: education interacts with female labor supply to influence

growth, suggesting that demographic and labor-market integration can amplify the developmental impact of education even when schooling attainment is not uniformly at the highest level (Goh et al., 2020).

Third, non-traditional and non-formal pathways provide viable routes to skill formation that support development when traditional schooling systems are constrained. MOOC-based and other digitally mediated learning approaches can raise competencies and employability at scale, expanding access to high-quality learning beyond formal institutions and enabling rapid upskilling in response to labor-market signals (Sukriono & Sudirman, 2020). Micro-credentials and stackable certificates offer flexible, market-relevant routes to credentialing that help workers transition into higher-productivity roles, particularly in dynamic sectors where formal curricula lag behind industry needs (Mhichíl et al., 2023). In parallel, high-quality pedagogy within conventional schooling—when coupled with teacher development and ICT-enabled learning—can yield disproportionate gains in 21st-century skill formation, thereby enhancing the developmental payoff of education even without universal, maximal schooling levels (Habets et al., 2020; Engelmann et al., 2022).

Together, these strands demonstrate that development can proceed with varied or moderate levels of education when education systems are embedded in an enabling ecosystem: coherent governance, labor-market signaling, sectoral upgrading, and access to flexible learning channels. The central implication for policy is not to pursue schooling in isolation, but to design an ecology that supports institutions, adaptable curricula, and diversified pathways for skill formation, thereby amplifying the quality, relevance, and alignment of education with national development priorities. In this view, education remains a foundational input, but its developmental value is realized through a holistic architecture that leverages both traditional schooling and innovative, context-sensitive approaches to learning.

Alternative Pathways to Development (Governance, Entrepreneurship, ICT, and Open/Online Learning)

Beyond traditional schooling, development can be advanced through a portfolio of alternative pathways that leverage governance, entrepreneurial ecosystems, and ICT-enabled learning. However, the effectiveness of these pathways hinges on strategic policy design that aligns them with national development goals and ensures equitable access. This section highlights four interlocking avenues—governance and e-government, entrepreneurship-focused education, ICT-enabled learning platforms, and open/online learning—each of which can accelerate development even when formal schooling is uneven or limited. The central argument is pragmatic: when designed to align with labor-market needs and innovation priorities, these pathways can substitute for or complement conventional education to produce meaningful economic and social gains (Abdulazeez et al., 2020; Das & Das, 2021).

Governance and e-government as catalysts for entrepreneurship. The digitization of government services lowers entry barriers for new firms by simplifying online licensing, registration, and regulatory compliance. Das and Das (2021) provide cross-country evidence that online government services can ease the process of starting a business, thereby expanding the pipeline of micro- and small enterprises and contributing to broader economic dynamism. When combined with transparent, predictable regulatory environments and accessible digital infrastructure, e-government acts as a force multiplier for entrepreneurs, enabling a faster path to market and reducing information frictions that often hinder early-stage firms. This governance-enabled environment enables human capital to translate into productive activity more efficiently, reinforcing the role of education-related skills as inputs rather than as the sole determinants of development.

MOOCs and entrepreneurship education as scalable catalysts. Massive Open Online Courses (MOOCs) have transformed access to entrepreneurship content and practice, extending opportunity beyond privileged cohorts to aspiring entrepreneurs in diverse contexts.

Foundational studies show that MOOCs can deliver high-quality, market-relevant instruction at scale, fostering entrepreneurial competencies, self-efficacy, and practical know-how in areas such as technology entrepreneurship and business model design (Żur, 2018). Cirulli et al. (2016) document how MOOCs support personalized learning in technology entrepreneurship, enabling learners to acquire domain-specific knowledge and apply it to venture creation. Żur (2018) emphasizes that MOOCs are reshaping entrepreneurship learning ecosystems by offering flexible pathways that can be stacked with other credentials, thereby supporting continuous entrepreneurial development despite constraints on traditional schooling, geographic location, or time. In practical terms, MOOC-based entrepreneurship education can seed startup activity, augmenting local innovation ecosystems when paired with supportive policy and access to finance (Navío-Marco & García, 2019).

ICT-enabled learning platforms and blended modalities. ICT-enabled learning—ranging from online modules to blended courses—expands the reach and effectiveness of entrepreneurship education. Abdulazeez et al. (2020) demonstrate how dedicated MOOCs can serve as digital scaffolding for higher education reform in resource-limited regions, highlighting the importance of digital infrastructure in expanding access to high-quality content. Basantia and Kumar (2022) contrast MOOCs with traditional distance education, underscoring how open online formats can meet contemporary needs for rapid upskilling and flexible participation in entrepreneurial training. The integration of various online resources, such as YouTube, is illustrated by Chorna et al. (2023), indicating that these tools can support important foundational capabilities for entrepreneurship and cross-border collaboration. Together, these sources support a robust inference: ICT-enabled learning platforms can accelerate skill formation, collaboration, and market-oriented entrepreneurship, even where formal schooling is uneven.

Open/online learning ecosystems and inclusive entrepreneurship. Open learning communities and distance education environments foster inclusive pathways to entrepreneurship, enabling learners to access mentors, peers, and practical opportunities remotely. Navío-Marco and García (2019) show how distance education can cultivate social entrepreneurship by building commitment and interactivity within learning communities. This mechanism translates into venture creation and community impact when adequately supported. Rono et al. (2017) argue for flexible learning designs that center on learner fit and inclusion, thereby broadening participation in entrepreneurial education and helping diverse aspiring entrepreneurs overcome barriers to entry. In pandemic and post-pandemic contexts, blended learning designs—combining online resources with hands-on, practice-oriented experiences—have demonstrated resilience and effectiveness for entrepreneurship education, enabling continued skill formation when face-to-face delivery is constrained (Syafidah et al., 2021).

Policy implications and synthesis. The evidence indicates that governance reform, MOOC-based entrepreneurship training, ICT-enabled learning, and open online modalities collectively offer viable, scalable routes to development. The key to success lies in aligning these pathways with labor market signaling, offering modular, stackable credentials, and ensuring inclusive access to digital infrastructure and high-quality content. When governments invest in streamlined e-government services, credible online education platforms, and supportive ecosystems for entrepreneurs (finance, networks, mentorship), the developmental payoff from education-related inputs—whether formal schooling or alternative channels—becomes more precise and more durable.

Empirical Evidence of Non-Education Pathways to Development in Asia

Across Asia, development has often advanced through channels beyond formal schooling when resource wealth, governance, and strategic policy design align with national priorities. Oil- and gas-rich economies in the region illustrate how energy endowments can catalyze growth and structural upgrading even when education levels alone do not reach top-quartile benchmarks.

This section aggregates country-specific evidence, highlighting how non-education pathways—such as resource rents, infrastructure investment, governance reforms, and regional energy integration—can sustain development in oil-dependent contexts.

Azerbaijan exemplifies how petroleum wealth can be translated into broader development outcomes when complemented by governance reforms and diversification efforts. Resource rents have supported large-scale investments in infrastructure, energy logistics, and export capacity, creating spillovers to non-resource sectors through improved logistics, job creation, and tax revenues that finance public goods. However, the literature underscores that without sound institutions, the resource boon can falter; thus, Azerbaijan's relative success is linked to policy choices and governance arrangements that mitigate the so-called resource curse (Bayülgen, 2005). The country's experience—alongside broader discussions of energy diplomacy and sovereign wealth management—emphasizes that resource wealth can be a developmental asset rather than a liability when embedded in a credible governance framework (Ahmadova et al., 2021).

Kazakhstan and its Central-North Asian neighbors illustrate how oil-and-gas wealth can underpin sustained development when managed within coherent institutional and policy frameworks. Empirical studies from the region report positive links between mineral rents and productivity growth where institutional quality, macroeconomic stability, and deliberate diversification policies are in place (Ghebrezgabher & Sereke, 2021). In Kazakhstan, energy rents have been channeled into transport and export infrastructure, fiscal stabilization mechanisms that smooth commodity cycles, and targeted incentives for knowledge-intensive and export-oriented investments that promote technology adoption and human-capital deepening (Ahumada & Villarreal, 2022). Across Central-North Asia more broadly, evidence shows that energy revenues have financed infrastructure expansion and regional development, supporting poverty reduction when accompanied by reforms that improve the investment climate and market functioning (Duan & Duan, 2023). Crucially, the region's growth dividend is conditional on aligning energy-led investment with productive sectors and insulating public finances from price volatility through prudent fiscal management and diversification strategies. These country- and regional-level findings underscore that the developmental value of resource rents materializes primarily within an enabling policy architecture characterized by transparency, accountability, and mechanisms that direct rents toward long-term productivity and inclusive outcomes.

Malaysia reinforces this point with a diversified growth trajectory anchored in oil and gas but characterized by early diversification into manufacturing and services, prudent macro-management, and open trade. Oil resources in Malaysia have coexisted with robust project financing, investment in human capital, and regionally integrated supply chains, contributing to sustained growth and development outcomes even when schooling outcomes were not uniformly optimal across all regions. The Malaysian case supports the argument that resource-rich economies can achieve durable development by combining resource-led momentum with diversification, governance, and infrastructure investment (Zawawi, 2023).

Collectively, these countries' experiences in Asia corroborate a nuanced view: development can proceed through non-education pathways when oil and gas wealth is managed within transparent, accountable institutions and paired with structural upgrading, infrastructure investment, and integration into regional energy and trade networks. The resource-rich, governance-enabled development model—whether in Azerbaijan, Kazakhstan, Central-North Asian states, or Malaysia—demonstrates that the education-development link, while important, is not a universal prerequisite. Instead, resource rents can catalyze broader development outcomes when policy architecture ensures that energy wealth stimulates productivity, innovation, and inclusion rather than entrenching rents or fostering Dutch disease.

Conclusion

To address the central inquiry—whether formal education is invariably a necessary prerequisite for national development—this synthesis reveals a complex reality: education is a foundational catalyst, but it is not a stand-alone determinant. The empirical consensus of the 21st century dictates that while education builds essential human capital and innovative capacity, its transformative power is deeply contingent upon the surrounding ecosystem. The strength and direction of the education-development nexus are strongly shaped by governance quality, institutional integrity, labor-market signaling, and the presence of complementary inputs such as technology and entrepreneurial ecosystems. The conventional adage that "education builds people, and people build nations" holds only when schooling is embedded within a concrete political economy capable of translating learning into productive, inclusive, and sustainable growth.

This nuanced reality requires a paradigm shift from viewing education in isolation to understanding it as one component of a holistic development strategy. As the literature highlights, educational attainment reaches its full potential only when aligned with sound macroeconomic policies and transparent governance. East Asian models, such as Japan, South Korea, and Taiwan, demonstrate that education's efficacy is magnified by industrial policy and an enabling business environment. Conversely, in contexts plagued by fragile institutions, massive educational investments may fail to yield meaningful development, risking resource misallocation, social inequality, and the undermining of environmental resilience.

Furthermore, regional evidence underscores that development pathways in Asia are highly diversified. Success stories systematically integrate education with other strategic levers; for instance, Indonesia's poverty reduction and Malaysia's demographic and labor-market policies illustrate that educational reforms are most enduring when coupled with structural and macroeconomic interventions. Nepal's experience reveals that targeted human capital investments yield substantial dividends even under strict fiscal constraints. Crucially, the alternative pathways observed in resource-rich nations like Azerbaijan and Kazakhstan prove that robust governance, infrastructure investment, and economic diversification can drive development even without top-tier aggregate educational attainment. Digital governance and alternative learning modalities (e.g., MOOCs, ICT platforms) further illustrate that progress can bypass traditional formal schooling bottlenecks if the regulatory and digital infrastructure is robust.

Ultimately, policymakers must abandon isolated, linear educational targets in favor of integrated reform packages. Education remains a powerful engine, but for 2 l st-century Asia, sustainable development requires a multi-input strategy that harmonizes human capital formation with technological adoption, green diversification, and robust institutional governance. Future research should employ micro-level, quasi-experimental designs to untangle these causal mechanisms across diverse Asian contexts, ensuring that learning systems are dynamically aligned with the sustainable and inclusive development goals of the future.

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