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# Digital Inequality in Indonesian Education: Evidence from ICT Utilization Among Students in 2025

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**Abstract:** Digital transformation has reshaped global educational delivery, yet unequal access to productive digital technologies threatens to widen learning disparities. This study investigates multidimensional digital inequality in Indonesian education using Information and Communication Technology (ICT) utilization data from Education Statistics 2025 published by Statistics Indonesia (BPS). Employing a descriptive comparative quantitative design, the analysis evaluates mobile phone, computer/laptop, and internet utilization among students aged 5–23 years across educational tiers and socio-demographic strata. The findings reveal a pronounced device-capability divide: while 85.78% of students use mobile phones and 83.80% access the internet, only 19.80% utilize computers or laptops. Marked stratification also persists across schooling levels rising from 5.00% computer use in primary school to 64.24% in higher education as well as across household expenditure quintiles, disability status, and urban–rural residence. The study concludes that high mobile connectivity masks a second-level digital divide in productive computing access, necessitating targeted device provision, school laboratory modernization, and inclusive digital infrastructure policies.

**Keywords:** Digital Inequality; ICT Utilization; Digital Divide; Educational Equity; Indonesia

## 1. Introduction

Digital transformation has fundamentally reconfigured contemporary education systems by expanding access to online learning platforms, open educational resources, virtual collaboration, and technology-enhanced pedagogy [1], [2]. Equitable access to Information and Communication Technology (ICT) is increasingly recognized as a foundational prerequisite for improving instructional quality, fostering digital literacy, and preparing learners for participation in a knowledge-intensive global economy [3]–[5]. However, digital divide scholarship demonstrates that technological expansion does not diffuse uniformly across societies; instead, asymmetries in infrastructure, household purchasing power, and socio-spatial conditions reproduce stratified educational opportunities [6]–[8].

In digital inequality theory, scholars distinguish between the first-level digital divide which concerns physical access to basic devices and internet connectivity and the second-level digital divide, which reflects disparities in productive hardware, digital skills, and meaningful content creation [6]–[8]. Students equipped with personal computers or laptops and stable broadband can engage in complex cognitive tasks such as academic writing, data analysis, coding, and multimedia production, whereas learners restricted to small-screen mobile phones experience constrained digital participation [2], [8], [9].

Indonesia has achieved substantial gains in aggregate digital connectivity over the past decade, driven by rapid mobile broadband expansion and widespread smartphone adoption [10]–[12]. Concurrently, national development agendas including the National Long-Term Development Plan (RPJPN 2025–2045) and national digital literacy programs emphasize educational digitalization as a strategic lever for human capital formation [13]–[15]. Nevertheless, significant disparities persist across socioeconomic strata, geographical territories, and vulnerable learner populations [16]–[18].

Official national statistics published in Education Statistics 2025 (Statistik Pendidikan 2025) by Statistics Indonesia (Badan Pusat Statistik [BPS]) provide an authoritative empirical foundation for evaluating student ICT

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utilization across Indonesia [16]. While existing studies have examined classroom technology adoption or national internet penetration [1], [12], [14], fewer empirical analyses systematically contrast mobile connectivity against productive computing access across educational tiers and socio-demographic subgroups. To address this gap, this study investigates digital inequality among Indonesian students aged 5–23 years using 2025 national statistics [16]. Specifically, the study aims to: (1) quantify the gap between basic mobile/internet connectivity and productive computer/laptop utilization; (2) examine ICT utilization trajectories across primary, secondary, and higher education; and (3) analyze socio-demographic stratification across gender, disability status, household expenditure quintiles, and urban–rural residence to inform inclusive digital education policies.

## 2. Methodology

### 2.1. Research Design

This study employed a descriptive comparative quantitative design utilizing official secondary statistical data from Education Statistics 2025 published by Statistics Indonesia (BPS) [16]. A descriptive comparative design is well suited for macro-level educational equity analysis aimed at mapping technology adoption distributions, diagnosing multi-tier device gaps, and identifying structural inequalities across population subgroups rather than estimating causal econometric models [19], [20].

Analytically, the research design operationalizes the conceptual distinction between basic connectivity and productive computing access [6], [8]. By juxtaposing mobile phone and internet usage against computer/laptop utilization across educational levels and demographic strata, the study evaluates both first-level access and second-level capability disparities within Indonesia's student population [2], [16].

### 2.2. Data Source and Indicator Framework

Primary empirical data were obtained from Education Statistics 2025 (Statistik Pendidikan 2025), which compiles nationally representative household survey estimates from the National Socioeconomic Survey (Susenas) administered by Statistics Indonesia (BPS) [10], [16]. The target analytical population comprises formal students aged 5–23 years spanning four educational tiers: primary school (SD), junior secondary school (SMP), senior secondary school (SMA/SMK), and higher education [14], [16].

Three core ICT utilization indicators were analyzed (measured as the percentage of enrolled students utilizing each technology during the reference period): (1) mobile phone utilization (capturing ubiquitous personal communication and mobile-first access); (2) internet utilization (capturing general online connectivity); and (3) computer or laptop utilization (capturing access to productive computing hardware required for academic writing, software operation, and computational tasks) [2], [8], [16]. To capture intersectional inequality, these indicators were examined across five disaggregation dimensions: educational level, gender, disability status, household expenditure quintile, and urban–rural classification [6], [16], [18].

### 2.3. Analytical Procedure

Data analysis proceeded through a structured four-stage comparative protocol [16], [20]. First, aggregate and disaggregated student ICT utilization statistics were extracted from Education Statistics 2025, cross-verified against national statistical abstracts, and structured into standardized analytical tables [10], [16]. Second, cross-device disparity metrics were calculated specifically the percentage-point gap and utilization ratio between mobile/internet access and computer/laptop usage to quantify the magnitude of the productive device divide [6], [8]. Third, comparative gradients were evaluated across schooling levels and socio-demographic dimensions (gender, disability status, household expenditure, and urban–rural location) to identify marginalized student groups [7], [18]. Fourth, empirical patterns were synthesized within a digital inclusion governance framework to formulate targeted policy recommendations [13], [15], [17].

## 3. Results and Discussion

The empirical analysis of 2025 national student ICT statistics reveals a striking structural asymmetry between widespread mobile-internet connectivity and limited access to productive computing devices [16]. The findings and their educational equity implications are examined across four analytical dimensions below.

### 3.1. Aggregate Student ICT Utilization and the Mobile–Computer Divide

Across all Indonesian students aged 5–23 years in 2025, basic digital connectivity has reached near-universal levels, whereas access to personal computers or laptops remains markedly constrained [16]. Table 1 summarizes aggregate utilization rates and cross-device disparity metrics.

Table 1. Aggregate ICT Utilization Among Indonesian Students Aged 5–23 Years (2025)

| ICT Indicator | Utilization Rate (%) | Non-Utilization Gap (%) | Functional Digital Dimension |
|---|---|---|---|
| Mobile Phone Utilization | 85.78% | 14.22% | Basic mobile communication & portable access |
| Internet Utilization | 83.80% | 16.20% | General online connectivity & information retrieval |
| Computer / Laptop Utilization | 19.80% | 80.20% | Productive computing, content creation & software |

As shown in Table 1, 85.78% of Indonesian students use mobile phones and 83.80% access the internet, whereas only 19.80% utilize computers or laptops leaving 80.20% of students without regular computing access [16]. This 65.98-percentage-point gap (a mobile-to-computer utilization ratio of 4.33:1) confirms that student digital participation in Indonesia is overwhelmingly smartphone-centric [4], [8], [16]. While smartphones facilitate instant messaging, video streaming, and basic information lookup, they are poorly suited for higher-order academic production such as word processing, spreadsheet modeling, coding, data visualization, and specialized educational software [2], [9], [15]. Consequently, high headline internet penetration conceals a deep second-level digital divide in productive computing capability [6], [8].

### 3.2. ICT Utilization Across Educational Tiers

Disaggregating utilization rates across formal schooling levels reveals steep upward progression as students advance toward higher education, accompanied by persistent bottlenecks in computer access at primary and secondary stages [16], [20]. Table 2 and Figure 1 present cross-level ICT utilization patterns in 2025.

Table 2. Student ICT Utilization by Educational Level in Indonesia (2025)

| Educational Level | Mobile Phone (%) | Internet (%) | Computer/Laptop (%) | Mobile–Computer Gap (pp) |
|---|---|---|---|---|
| Primary School (SD) | 75.49% | 72.26% | 5.00% | 70.49 pp |
| Junior Secondary (SMP) | 92.45% | 91.04% | 20.74% | 71.71 pp |
| Senior Secondary (SMA/SMK) | 97.83% | 97.47% | 34.40% | 63.43 pp |
| Higher Education | 99.51% | 99.29% | 64.24% | 35.27 pp |

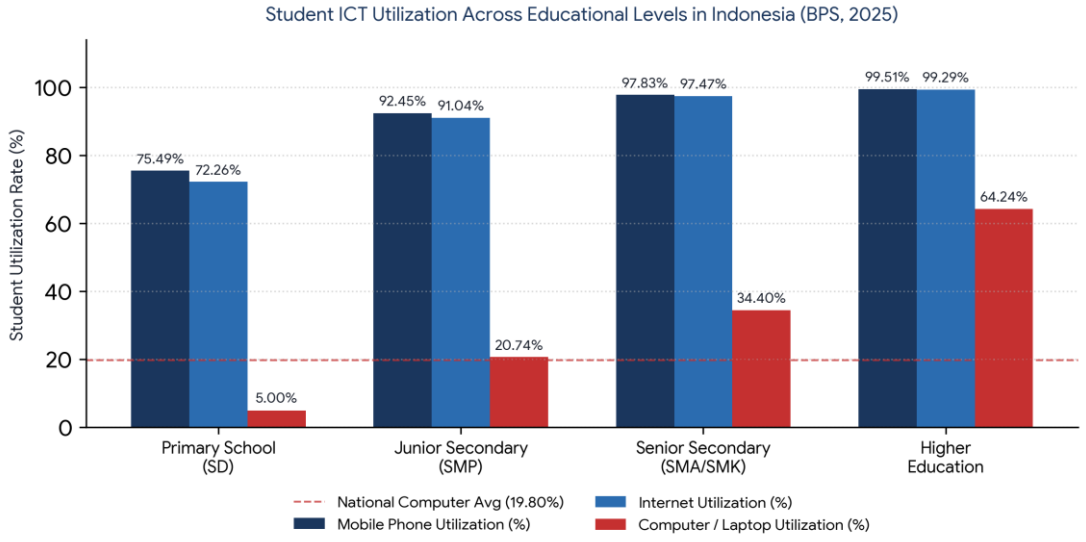


Figure 1. Comparison of mobile phone, internet, and computer/laptop utilization across Indonesian educational levels in 2025 (Source: Processed from BPS [16]).

Table 2 and Figure 1 demonstrate that while mobile phone and internet usage already exceed 72% in primary school (75.49% and 72.26%) and surpass 97% in senior secondary school (97.83% and 97.47%), computer/laptop utilization remains severely depressed throughout compulsory schooling: only 5.00% in SD, 20.74% in SMP, and

34.40% in SMA/SMK [16]. Even in higher education where academic coursework routinely requires word processing, statistical software, and research databases more than one-third of university students (35.76%) still lack regular computer/laptop usage [16]. Because nearly two-thirds (65.60%) of senior secondary students graduate without regular computing access, incoming tertiary students and youth entering the labor market face an acute readiness deficit [9], [15].

### 3.3. Socio-Demographic and Spatial Dimensions of Digital Inequality

Beyond educational stage, disaggregated BPS data expose pronounced intersectional disparities across socio-demographic and spatial dimensions [16], summarized in Table 3.

Table 3. Synthesis of Socio-Demographic and Spatial Stratification in Student ICT Utilization (2025)

| Stratification Dimension | Advantaged Group | Disadvantaged Group | Primary Inequality Pattern & Mechanism |
|---|---|---|---|
| Gender | Female students (slightly higher PC use) | Male students (comparable mobile/net) | Near gender parity in mobile/internet; slight female lead in computer use |
| Disability Status | Non-disabled students | Students with disabilities | Lower access across all 3 ICT indicators; assistive technology barriers |
| Household Economy | Top expenditure quintile (Q5) | Bottom expenditure quintile (Q1) | Steep wealth gradient in PC ownership & broadband affordability |
| Spatial Location | Urban students | Rural students | Comparable mobile use, but wide rural deficit in PCs & fixed broadband |

Four structural patterns emerge from Table 3 [16]. First, gender disparities in basic mobile and internet connectivity have largely closed, with female students exhibiting marginally higher computer/laptop utilization than male peers indicating that gender is no longer the primary axis of student access inequality in Indonesia [16], [20]. Second, disability status constitutes a critical axis of exclusion: students with disabilities record substantially lower utilization across mobile phones, computers, and the internet than non-disabled peers, reflecting shortages of assistive hardware, accessible digital platforms, and adaptive pedagogy [1], [16], [18].

Third, household economic status measured via household expenditure quintiles strongly stratifies access to productive computing devices [6], [7], [16]. While mobile phones have diffused into lower-income households, laptops and fixed home broadband remain disproportionately concentrated in the highest expenditure quintile, creating an affordability barrier for low-income learners [8], [18]. Fourth, urban–rural geography reinforces this device divide: rural students achieve relatively high mobile phone adoption but lag substantially behind urban students in computer/laptop utilization and high-speed internet quality due to uneven telecommunications infrastructure and lower household income [12], [16], [17].

### 3.4. Implications for Educational Equity, Policy, and Research

The empirical evidence underscores that Indonesia's educational digitalization challenge has shifted from basic network coverage to equitable access to productive computing tools [2], [6], [8]. Relying on smartphone-only access risks institutionalizing a two-tier learning ecosystem in which affluent urban students cultivate advanced digital creation and computational competencies, while rural, low-income, and disabled students remain passive consumers of mobile content [7], [9], [15]. Left unaddressed, this second-level digital divide will compound existing disparities in learning outcomes, higher education readiness, and youth labor market competitiveness [9], [17].

To advance inclusive digital transformation aligned with RPJPN 2025–2045 [14], policymakers should implement three targeted governance interventions: (1) modernize school-based computer laboratories and Chromebook/laptop lending libraries prioritizing junior and senior secondary schools (where computer utilization stands at 20.74% and 34.40%) so students acquire computing proficiency before entering higher education or employment [2], [13], [16]; (2) integrate targeted device subsidies and zero-rated educational broadband into the Smart Indonesia Program (Program Indonesia Pintar) for students in the bottom two expenditure quintiles and rural areas [11], [17], [18]; and (3) mandate universal accessibility standards and assistive ICT procurement for special education and inclusive schools serving learners with disabilities [1], [18].

From a scholarly perspective, this study contributes an empirical operationalization of first-level versus second-level digital divide theory using Indonesia's 2025 national student ICT dataset [6], [8], [16]. Two methodological limitations should be noted: (1) Susenas-based utilization rates capture device usage frequency

rather than digital literacy proficiency or pedagogical integration quality [1], [20]; and (2) national demographic disaggregations do not capture inter-provincial variation across Indonesia's 38 provinces [10], [16]. Future research should combine provincial panel datasets with student digital competence assessments to evaluate the learning impact of school device-provision programs [2], [16], [20].

## 4. Conclusion

This study investigated digital inequality in Indonesian education using 2025 student ICT utilization statistics for learners aged 5–23 years [16]. The findings reveal a pronounced divergence between widespread mobile-internet connectivity with 85.78% using mobile phones and 83.80% accessing the internet and severely limited access to productive computing hardware, with only 19.80% utilizing computers or laptops. Furthermore, substantial stratification persists across educational levels (ranging from 5.00% computer utilization in primary school to 64.24% in higher education), household expenditure quintiles, disability status, and urban–rural locations.

These results demonstrate that high smartphone penetration does not equate to genuine digital inclusion in education [6], [8]. Achieving equitable learning opportunities requires moving beyond basic connectivity expansion toward targeted investments in school computing infrastructure, pro-poor device assistance, rural broadband quality, and assistive technologies for students with disabilities [1], [14], [18]. Subsequent empirical investigations incorporating provincial spatial analysis and digital skill assessments are recommended to guide evidence-based digital inclusion policies.

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