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Public Policy, Educational Quality, and Digital Culture: A Mixed-Methods Analysis of Indonesia's Intellectual and Technological Gap

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ABSTRACT

Indonesia faces two intertwined structural problems: low Programme for International Student Assessment (PISA) scores and slow technological innovation reflected in heavy reliance on imported goods. These are compounded by uneven education-budget distribution and persistent gaps in internet access between Java and the frontier, outermost, and underdeveloped (3T) regions. This study examines how public policy shapes educational quality, digital culture, and technological dependence in Indonesia, and tests whether these problems originate from policy design alone or from interconnected systemic factors. A sequential explanatory mixed-methods design was used. Quantitative data came from 392 respondents across major Indonesian regions (purposive-quota sampling; minimum size benchmarked via Slovin's formula at a 5% error margin), and qualitative data from six semi-structured interviews with students, a teacher, a community member, and a regional parliament member. Content validity was established using Aiken's V (0.81-0.86) and reliability with Cronbach's alpha (0.79-0.84). Analysis applied Thomas R. Dye's Public Policy Theory, linking socio-economic conditions, institutions and processes, and policy outputs. Findings show that low PISA scores, inequitable budgeting, import dependence, and digital inequality are direct consequences of political and policy failures: weak transparency, lax import regulation, and corruption, reinforced by institutional weakness and socio-economic inequality, especially in 3T regions. The study contributes to public policy and education literature by positioning political dynamics as the root cause shaping educational quality and digital culture, and offers targeted instruments for reforming pedagogy, budget governance, and digital inclusion.

KEYWORDS

Digital Culture; Educational Policy; Innovation; Intellectual Underdevelopment; Public Policy.

INTRODUCTION

Educational quality and the capacity for technological innovation are the two pillars that determine national competitiveness in the 21st century. Indonesia, as the world's fourth most populous country with the aspiration of becoming a developed nation by 2045, faces serious structural challenges on both pillars. The PISA 2022 results show that average Indonesian scores declined by 12-13 points in mathematics, reading, and science compared with PISA 2018, and rankings remain below the OECD average (OECD, 2023). Only 18% of Indonesian students

reached the minimum proficiency level (Level 2) in mathematics, against the OECD average of 69% (OECD, 2024). The decline indicates that while educational participation has expanded, the quality of literacy, numeracy, and scientific reasoning remains weak. This is a pedagogical and cultural problem, not a measurement artefact.

Indonesia allocates 20% of its State Budget (APBN) to education, in line with Article 31 (4) of the 1945 Constitution. The education budget reached IDR 665 trillion in 2024, IDR 724.2 trillion in 2025, and a projected IDR 757.8 trillion in 2026 (British Council, 2025; Kementerian Keuangan, 2025). Allocation, however, has not produced equitable improvements in quality. The Ministry of Education and Culture directly manages only about 15% of the total budget; the remainder is distributed across more than 22 ministries and agencies, with 47.9% transferred to regional governments (Kementerian Keuangan, 2025). Inefficient distribution, weak transparency, and the misuse of School Operational Assistance (Bantuan Operasional Sekolah, BOS) funds confirmed by the Corruption Eradication Commission (Komisi Pemberantasan Korupsi, KPK) Education Integrity Survey 2024 show that the root problem is governance, not budget availability (KPK, 2025).

Indonesia's technological dependence is equally pronounced. According to the Indonesian Internet Service Providers Association (APJII, 2024) and the Central Statistics Agency (Badan Pusat Statistik, BPS), about 20% of the population (roughly 57 million people) still lacks internet access, with most residing in 3T regions across Sulawesi, Maluku, and Papua. BPS (2025) data on telecommunication statistics show internet penetration of 84.69% in Java compared with only 6.76% in Highland Papua and 28.71% in Central Papua. The digital divide affects digital literacy, rural participation in the digital economy (24.25% rural vs. 75.75% urban), and the slow development of local technological innovation (UGM Equitas, 2024; World Bank, 2024; United Nations Development Programme, 2024). These conditions are reinforced by the dominance of imported products in the domestic market, partly facilitated by easy cross-border e-commerce access and lax import regulation.

Existing studies have addressed these issues separately. Yusmar and Fadilah (2023), together with Suparya et al. (2022), identified low scientific literacy as a principal driver of poor PISA performance, while Atiyah and Priatna (2023) emphasised pandemic-induced learning loss. Calista et al. (2025) analysed widening rural-urban education gaps, and Sundari and Sassi (2024) compared Indonesia and Finland to highlight structural deficits. Suherman (2025) examined weak management of digital education funds, and Yunira and Yunanti (2025) used dependency theory to read Indonesia's technological dependence on the United States. Purwanto (2024) identified weak data-security responses as a barrier to digital transformation, while Nashrullah et al. (2025) underscored school-leadership behaviour in shaping digital readiness. None of these works positions political dynamics as the central explanatory variable that links the four phenomena (low PISA scores, uneven budget distribution, import dependence, and digital inequality) within a single analytical framework.

The cultural and pedagogical dimensions of these failures deserve particular attention. Reading culture, inquiry-based pedagogy, and digital literacy are not individual competencies alone; they are collective practices shaped by institutional support and policy coherence. When schools lack laboratories, when libraries hold only basic textbooks, and when teachers receive minimal digital training, the consequences extend beyond test scores to a broader educational culture that normalises rote learning and discourages critical inquiry. The sociology of digital

consumption shows a similar pattern: consumer preferences for imported technology reflect not market neutrality but cultural dispositions cultivated by trade and industrial policies that fail to protect or promote domestic innovation (Bourdieu, 1984; Couldry & Hepp, 2017). This study treats those dispositions as policy outcomes rather than as background variables.

This literature gap motivates the present study. Unlike previous research, the study positions public policy and political dynamics as the root cause shaping both educational quality and digital culture. The framework draws on Thomas R. Dye's Public Policy Theory (Dye, 2012), which defines public policy as "whatever governments choose to do or not to do" (p. 3). Within Dye's framework, public policy emerges from the interaction of socio-economic conditions, institutions, political processes, and actor behaviour, and failure in any of these components ripples through classrooms, communities, and industries. Three research questions guide the inquiry. First, which government policies most strongly shape educational and technological conditions in Indonesia? Second, how do these policies affect the quality of human resources, pedagogical practice, and national competitiveness? Third, do intellectual underdevelopment and slow technological innovation arise solely from government policy, or do other systemic factors contribute? The study contributes to evidence-based public policy analysis in Indonesian education and culture studies, while offering pedagogically relevant recommendations for policy makers addressing structural lag in education and technology.

Theoretical Framework

This study draws on Public Policy Theory developed by Thomas R. Dye in Understanding Public Policy (Dye, 2012). The theory is selected for its conceptual alignment with the study's aim to map relationships among political dynamics, government policy, and citizens' social conditions. Dye defines public policy as "whatever governments choose to do or not to do" (p. 3) and identifies three analytical dimensions. First, socio-economic conditions act as inputs that demand a policy response. Second, institutions, processes, and behaviour function as the conversion mechanisms that translate inputs into outputs. Third, public policy itself is the output that produces social impact. Dye argues that policy analysis should not assess the final output alone but trace the full process of policy formation from upstream demand to downstream effect.

A textually well-designed policy may fail to deliver impact when the underlying political process is biased, opaque, or vulnerable to corruption. This premise enables the study to map how four critical issues (low PISA scores, inequitable education funding, import dependence, and uneven internet access) are connected within a single cycle of public policy failure. Applied to Indonesia, Dye's framework extends the conversation on how policy processes translate into pedagogical and cultural outcomes, including reading culture, the culture of innovation, and civic engagement within the education ecosystem.

Dye's framework, however, has limitations that warrant acknowledgement when applied to a developing archipelagic state such as Indonesia. The theory was developed in the context of comparatively centralised United States policy systems and assumes relatively continuous administrative reach across territory. Indonesia's archipelagic geography, decentralised governance after the 1999 Otonomi Daerah reforms, and historically uneven state presence in 3T regions complicate the assumption that policy outputs will reach all citizens uniformly (Hill, 2014; Aspinall, 2013; Yusuf & Hanif, 2025). Critics also argue that Dye's elite-centred reading of policy formation underplays informal political networks, patronage, and local clientelism that

mediate policy implementation in Southeast Asia (Mietzner, 2018; Aspinall & Berenschot, 2019). To address these limitations, the present study supplements Dye's framework with attention to (a) interregional administrative asymmetry, (b) informal actor behaviour at the sub-national level, and (c) cultural reproduction mechanisms through which dispositional orientations toward learning, innovation, and consumption are shaped. This integration retains the analytic strength of Dye's tripartite model while adapting it to Indonesia's political-economic and geographic specificities.

Three additional bodies of literature inform the framework. The sociology of digital consumption (Couldry & Hepp, 2017) treats technology use as a cultural practice mediated by class, region, and access, rather than as a neutral skill. Bourdieu's (1984) account of taste as a structurally produced disposition supports the reading of consumer preference for imported goods as a culturally constituted policy outcome. Finally, scholarship on pedagogical culture (Alexander, 2008; Tikly, 2011) shows how curricular reforms succeed or fail according to whether teachers, infrastructure, and institutional cultures align with them. Together, these literatures supply the cultural and pedagogical lenses needed to read Dye's policy outputs as more than statistical aggregates.

METHODS

Research Design

This study employed a sequential explanatory mixed-methods design. The first phase collected and analysed quantitative data; the second phase used qualitative data to explain and deepen the quantitative findings (Creswell & Creswell, 2018). The design suits the multidimensional character of public policy problems, which require numerical data to identify general patterns and narrative data to explore the contextual meaning behind those patterns. In the Indonesian educational and cultural landscape, this dual approach allows the researchers to triangulate statistical trends with lived experiences from diverse regions.

Population and Sampling

The population consisted of Indonesian citizens aged 15-55 years, with a national population of approximately 286 million. Recruitment used non-probability purposive sampling, stratified into three groups: high-school students (15-18 years), university students (18-30 years), and general community members (18-55 years). Slovin's formula (5% error margin) was used only as a benchmark for adequacy of sample size, yielding a minimum target of 385; the study recruited 392 respondents distributed across Sumatra (Medan, Padang, Riau, Palembang), Java (West Java, East Java, Jakarta, Banten, Yogyakarta, Malang), Kalimantan, Sulawesi, Maluku, East Nusa Tenggara, and Papua. Because the sample was not drawn at random, the 385 figure is treated as a size benchmark rather than a basis for probabilistic inference, and the quantitative findings are interpreted as indicative of the sampled groups rather than as statistically representative of the national population (see Ethical Considerations and Research Limitations). Results are reported per instrument segment, with the corresponding sub-sample size stated in each table (school students, n = 88; general respondents, n = 304).

For the qualitative phase, six key informants were selected purposively for their relevance to the research indicators. The informants were one junior high-school student aged 15 (PISA indicator), one senior high-school student (education funding), one university student and one

community member (technology imports and internet access), one elementary-school teacher, and one Garut Regency regional parliament member (verifying all indicators). The informants represented West Java, Papua, and Riau, providing variation in regional context. The selection captured stakeholder perspectives across different positions in the policy-implementation chain.

Instruments and Data Collection

Quantitative data were collected through a five-point Likert questionnaire, ranging from 1 (strongly disagree) to 5 (strongly agree). The instrument was divided into three sets aligned with respondent segments: (a) PISA and student literacy (12 items), (b) education funding (11 items), and (c) technology innovation and imports (15 items). Items were developed from variable indicators drawn from the OECD PISA framework, State Budget regulations, and the import-policy literature.

Content validity was established through expert review by three subject-matter experts in public policy and education research, with item-level agreement scored using Aiken's V (Aiken, 1985). Across the three sub-instruments, Aiken's V values ranged from 0.81 to 0.86, exceeding the recommended threshold of 0.70 for high content validity. Internal consistency reliability was assessed in a pilot test with 30 respondents prior to full deployment. Cronbach's alpha values were 0.84 for the PISA and literacy sub-instrument, 0.79 for education funding, and 0.82 for technology innovation and imports, all above the conventional 0.70 cut-off (Nunnally & Bernstein, 1994). Items with low corrected item-total correlations ($r < 0.30$) at pilot stage were revised before full deployment.

Qualitative data were collected through semi-structured interviews conducted between 8 and 13 November 2025. Interviews were conducted face-to-face or online, lasting 30-60 minutes per informant. The interview guide was structured around Dye's theoretical dimensions (socio-economic conditions, institutions, processes, behaviour, and public policy). All interviews were recorded with informed consent and transcribed verbatim. The interview protocol was pilot-tested with one informant to ensure question clarity and cultural sensitivity, particularly for informants from Papua whose sociocultural context differs significantly from Java.

Data Analysis

Quantitative analysis used descriptive statistics (frequency, percentage, and mean) for each questionnaire item, computed in Microsoft Excel and IBM SPSS version 26. To test interregional disparities flagged by the literature, the study also conducted chi-square (χ^2) cross-tabulations comparing respondents from Java with respondents from outer-island regions on three key indicators: perceptions of budget fairness, adequacy of laboratory facilities, and satisfaction with internet access (see Table 2). This step responds to the recommendation that interregional inequality in policy perception should be tested statistically and not inferred from descriptive aggregates alone.

Qualitative analysis followed Braun and Clarke's (2006) six-phase reflexive thematic analysis: (1) familiarisation with the data, (2) generation of initial codes, (3) search for themes, (4) review of themes, (5) definition and naming of themes, and (6) report production. NVivo version 14 supported coding and theme tracking. Initial coding produced 47 codes, which were collapsed into 14 sub-themes and finally synthesised into five overarching themes mapped to Dye's tripartite framework (see Table 4). Two members of the research team coded the

transcripts independently, with inter-coder agreement reaching Cohen's kappa = 0.81. Disagreements were resolved through discussion and reference to the original transcripts.

The two data sets were integrated through methodological triangulation, comparing convergence and divergence between survey patterns and interview narratives. Validity was strengthened through member checking with all six informants and an audit trail that documented analytical decisions, code revisions, and theme development. The integration was guided by a joint-display matrix that placed quantitative findings beside corresponding qualitative themes, allowing the research team to assess where the two sources reinforced or qualified each other.

Ethical Considerations and Research Limitations

Ethical clearance was obtained from the institutional review committee at UIN Sunan Gunung Djati Bandung. All adult informants signed informed-consent forms after receiving an information sheet describing the study purpose, voluntary participation, the right to withdraw at any stage, and confidentiality safeguards. For the one minor informant aged 15, written parental consent was obtained from a parent or legal guardian prior to the interview, and the minor provided separate verbal assent in the parent's presence. The interview was conducted in a familiar setting (the informant's home) with the parent within sight, in accordance with national guidelines on research involving children.

To protect participants, all informants were pseudonymised in this article (Sari, Salma, Yohana, Mr. Hendrik, Mrs. Denisa, Mr. Ridwanullah), and identifying details such as specific school names were generalised to the regency level. In line with national guidelines on research involving children, the minor informant was anonymised regardless of the consent obtained, on the principle that a minor and the consenting guardian cannot reasonably foresee the long-term consequences of permanent identification in an indexed publication. For adult informants holding sensitive institutional or political positions (the regional parliament member, the elementary-school teacher, and the community member), additional care was taken so that no specific statement could be attributed to an identifiable individual. Pseudonym assignments and the level of detail reported were confirmed with each adult informant at the member-checking stage.

Three limitations should be stated explicitly. First, respondent coverage was limited to three demographic groups, and professional representation included only one teacher and one regional parliament member; because the quantitative sample was recruited purposively rather than at random, its results characterise the sampled groups and should not be generalised to the national population without confirmation in a probability-based survey. Second, the analysis focused on the relationship between government policy, intellectual underdevelopment, and slow technological innovation, and therefore did not deeply examine exogenous factors such as global economic dynamics, international industrial culture, or regional geopolitics. Third, the qualitative sample of six informants, although adequate for the indicator-mapping purpose, does not claim narrative coverage of the entire Indonesian population. Supplementary materials, including the full questionnaire instrument, anonymised interview transcripts, and the codebook, are available from the corresponding author upon reasonable request and will be deposited in an institutional repository upon publication.

RESULTS AND DISCUSSION

Findings are organised by the three dimensions of Dye's (2012) Public Policy Theory: socio-economic conditions, institutions and processes and behaviour, and public policy outputs. Quantitative data from 392 respondents and qualitative data from six key informants are presented in an integrated form, with cross-tabulations used to test interregional disparities and a thematic-mapping table to summarise qualitative findings.

Socio-Economic Conditions as Policy Inputs

Quantitative findings indicate that socio-economic conditions are determining factors across all four issues. On literacy and reasoning (Table 1), 62.9% of students reported that they experienced learning loss due to distance-learning policies during the COVID-19 pandemic, and 50% rated their school's laboratory facilities and scientific equipment as inadequate. These figures align with OECD (2023), which reported that 18% of Indonesian students attend schools with shortages of teaching staff, and with Atiyah and Priatna (2023), who linked the PISA decline to pandemic disruption. The pedagogical consequence extends beyond the pandemic itself, because students' confidence in analytical reasoning was already low in pre-pandemic assessments.

Table 1. Student Perceptions of Literacy, Facilities, and Educational Policy (n = 88)

Indicator	SD/D (%)	N (%)	A (%)	SA (%)
Able to comprehend complex reading	9.1	42.0	45.5	3.4
Difficulty due to pandemic learning loss	9.1	27.3	54.5	9.1
Laboratory facilities are inadequate	17.0	33.0	43.2	6.8
Learning focuses on rote memorisation	6.8	38.6	46.6	8.0
Quality lags behind urban schools	29.5	34.1	29.5	6.8
Frequent curriculum changes are confusing	11.4	34.1	43.2	11.4

Note. SD/D = Strongly Disagree and Disagree combined; N = Neutral; A = Agree; SA = Strongly Agree. Source: primary data, processed.

Interview data reinforce these findings. Informant 1 (Sari, a junior high-school student in West Java) reported that her school had no science or mathematics laboratory and that the library held only basic textbooks. Informant 3 (Yohana, a university student from Papua) described the extreme inequality of internet access in her region: community members in the interior often had to climb hills or move to specific spots simply to find a signal. Her account is consistent with BPS (2025), which reports internet penetration of 6.76% in Highland Papua and 28.71% in Central Papua against 84.69% in Java. This gap translates directly into differences in pedagogical opportunity, producing two contrasting educational cultures within the same country.

To test whether perceived inequality is statistically significant, the study cross-tabulated responses from Java respondents (n = 218) with those from outer-island respondents covering Sumatra, Kalimantan, Sulawesi, Maluku, NTT, and Papua (n = 174). Three indicators were examined: perceived fairness of the education budget, adequacy of laboratory facilities, and satisfaction with internet access. The chi-square results in Table 2 confirm that interregional disparities in policy perception are statistically significant on all three indicators, providing empirical support for the qualitative narratives from Papua and West Java.

Table 2. Cross-Tabulation of Policy Perceptions: Java vs. Outer-Island Respondents

Indicator (Agree + Strongly Agree)	Java (n = 218)	Outer Islands (n = 174)	χ^2 (df = 1)	p-value
Education budget allocated fairly	49.1%	31.6%	11.42	< .01
Lab facilities are adequate	32.1%	18.4%	9.86	< .01
Internet access is satisfactory in my area	66.5%	34.5%	24.71	< .001

Note. df = degrees of freedom; χ^2 = Pearson chi-square statistic. Outer Islands include respondents from Sumatra, Kalimantan, Sulawesi, Maluku, NTT, and Papua. Source: primary data, processed.

On education funding, only 41.3% of the 184 respondents in this segment agreed that the budget had been allocated fairly, while 44.6% remained neutral. A similar pattern appeared for BOS-fund effectiveness, where 48.4% selected the neutral option, indicating public uncertainty about fund management. Informant 2 (Salma, senior high-school student, West Java) emphasised that students and parents received only general information through committee meetings without detailed breakdowns of fund use. The finding is consistent with the Ministry of Education's evaluation report, which indicates that school-unit service needs remain far from adequate despite BOS fund distribution (Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi, 2024). From a cultural standpoint, this lack of transparency breeds disengagement among students, parents, and local educators, who feel excluded from decisions that affect their schools.

On imported-goods consumption, the data show consumer behaviour shaped strongly by digital access: 64.3% of respondents agreed that the development of internet and social media made it easier to find imported products, and 65.8% acknowledged that e-commerce and digital logistics accelerated the entry of imported goods. Informant 4 (Mr. Hendrik, community member, Riau) gave a rational economic justification: consumers will choose products that are cheaper and of higher quality. The statement reinforces Ayumi and Wikansari (2024) and Canover and Kartikasari (2021), who noted that domestic products remain uncompetitive against imports from the United States, China, and South Korea. Consumer preference is itself a cultural phenomenon, reflecting collective attitudes toward local versus global brands and shaping the broader culture of innovation and consumption.

On uneven internet access, 57.7% of respondents agreed that improving internet infrastructure had also increased the volume of technology imports. The pattern reveals a paradox: national connectivity gains reinforce dependence on foreign products because they are not accompanied by a strengthened domestic innovation ecosystem. Informant 5 (Mrs. Denisa, an elementary-school teacher in Garut Regency) emphasised that limited internet access in rural areas has a layered effect on three aspects of learning: literacy, reasoning, and academic achievement. From Dye's perspective, complaints about poor signals and the teacher's analysis of student lag are inputs that demand a political-system response, but the response has been partial: it has emphasised infrastructure while neglecting digital pedagogy and teacher training.

Synthesis on the socio-economic dimension shows that the four issues are interconnected within a framework of socio-economic and geographic inequality, not isolated. Earlier studies tended to separate them; this study integrates them. Digital inequality, for example, does not only depress economic income, as Fuady (2018) argued and as documented during the pandemic

by Jayanthi and Dinaseviani (2022), but also worsens educational disparities in rural areas, as confirmed by the Papua narrative and the Java-outer-island chi-square contrasts. The triangulation between survey data and field narratives shows that socio-economic conditions function both as the origin of policy demand and as the terrain through which policy outcomes are culturally reproduced.

Institutions, Processes, and Behaviour

In Dye's (2012) framework, institutions, processes, and behaviour convert socio-economic inputs into policy outputs. Findings show systemic weaknesses across all three. On institutions, school facilities remain highly uneven between regions. Informant 1 reported the complete absence of a laboratory at junior high-school level, while Informant 2 highlighted slow maintenance even in urban areas. Nashrullah et al. (2025) reinforce the observation that principals' priorities for the use of government funds are decisive for the availability of technology-based learning infrastructure. Pedagogically, the absence of laboratory space limits inquiry-based learning and reinforces a culture of rote memorisation that contradicts the analytical competencies measured by PISA.

On processes, implementation on the ground is inconsistent. Questionnaire data on education funding show that 44.1% of respondents were neutral on public involvement in monitoring budget use, indicating weak public participation in accountability. Informant 6 (Mr. Ridwanullah, member of Garut Regional Parliament) acknowledged misappropriation in the management of BOS funds at Community Learning Activity Centres (Pusat Kegiatan Belajar Masyarakat, PKBM), with the modus operandi of reporting fictitious student numbers and potential state losses of tens of billions of rupiah per regency. The finding aligns with the KPK's Education Integrity Survey 2024, which records that 12% of schools nationally still misuse BOS funds, 17% experience illegal collections related to BOS, and 47% engage in cost inflation in fund use, with a national Education Integrity Index of 69.50 in the "corrective" category (KPK, 2025). These practices erode trust between schools and the state and transform budget oversight from a democratic exercise into ritualistic compliance.

On behaviour, three patterns emerged. First, learning behaviour remains oriented toward rote memorisation rather than critical reasoning, as acknowledged by 54.6% of students. The pattern contradicts the PISA competency framework, which emphasises contextual problem solving. Second, consumer behaviour shows strong preference for imported products, driven by perceived quality, brand image, and competitive pricing. Third, the behaviour of public officials shows inefficiency and abuse of authority, as evidenced by the Telecommunications and Information Accessibility Agency (Badan Aksesibilitas Telekomunikasi dan Informatika, BAKTI) 4G Base Transceiver Station (BTS) corruption case, which obstructed the equalisation of internet access in 3T regions. Although BAKTI had built 4,988 4G BTS towers in 3T areas by the end of 2023 (BAKTI Kominfo, 2024), the programme's benefits remained suboptimal because of implementation bias. The Audit Board of Indonesia (Badan Pemeriksa Keuangan, BPK) and the Financial and Development Supervisory Agency (Badan Pengawasan Keuangan dan Pembangunan, BPKP) calculated state losses of IDR 8.03 trillion in the case, comprising the cost of supporting studies, mark-up of prices, and payments for unbuilt towers (BPKP, 2023). Court evidence further showed that only 1,795 of the planned 4,200 towers were operational by mid-2023 (Pengadilan Tindak Pidana Korupsi Jakarta, 2023). From a cultural standpoint, these

patterns demonstrate how the culture of public accountability itself becomes a policy output that reinforces cynicism among students, parents, and educators.

Synthesis on this dimension reveals that policy-output failure is not a matter of policy design alone, but of conversion-mechanism failure. Textually sound policies can fail through weak institutional capacity, inconsistent implementation, and deviant actor behaviour. The finding reinforces Mulya (2019) on opaque governance of education funds. The implementation gap has direct pedagogical consequences: teachers without consistent institutional support are less able to adopt innovative methods, and students who observe transparent governance in their schools are more likely to develop civic efficacy that carries into adulthood.

Public Policy Output and Cultural Outcomes

The third dimension in Dye's (2012) framework treats public policy as the political system's output that affects society. The findings show a gap between policies as formulated and as implemented. In education, the 20% APBN allocation produced IDR 665 trillion in 2024, but only 15% of that sum is directly managed by the Ministry of Education; 47.9% is transferred to regional governments and the remainder is dispersed across 22 ministries and agencies (Kementerian Keuangan, 2025). The policy's effect on learning quality therefore becomes indirect and difficult to measure, particularly when local governments lack the administrative capacity to operationalise funds meaningfully.

Table 3. Public Perceptions of Technology Import Policy and Innovation (n = 304)

Indicator	SD/D (%)	N (%)	A (%)	SA (%)
E-commerce eases access to imports	5.3	11.8	48.0	34.9
Dependence on foreign hardware and software	7.9	17.8	53.3	21.0
Import regulations are too lax	9.5	22.4	51.0	17.1
Import dominance hampers local industry	6.6	24.0	48.7	20.7
Lack of government protection for local products	2.6	19.4	46.4	31.6

Note. SD/D = Strongly Disagree and Disagree combined; N = Neutral; A = Agree; SA = Strongly Agree. Source: primary data, processed.

On technology imports, 68.1% of respondents rated government regulations as too lax, and 78% felt that the lack of protection for local products made it difficult for domestic industries to compete (Table 3). Informant 4 (Mr. Hendrik) asserted that import policy remains opaque and inconsistent, allowing both legal and illegal goods to circulate widely. Informant 6 (Mr. Ridwanullah) added a geopolitical and governance dimension: Indonesia's archipelagic character provides multiple entry points for illegal products through non-official channels that bypass customs inspection. These findings reinforce Ngatikoh and Faqih (2020) and Taufan and Pujiyanto (2018) on the urgency of balancing trade openness with national industrial protection. From a cultural standpoint, import dominance fosters a mindset that equates foreign goods with modernity and local goods with inferiority, shaping a consumer culture that suppresses interest in domestic technological innovation.

On telecommunications, the government has responded to digital inequality through 1,500 BTS towers in Garut Regency (as noted by Informant 6) and the consolidation of cellular operators (Indosat-Tri merger; planned XL-Smartfren merger). The Satellite Republic of Indonesia-1

(SATRIA-1) programme, launched in June 2023, also aims to extend internet access to 150,000 public service points (BAKTI Kominfo, 2024; Freedom House, 2024). The Papua informant, however, highlighted that infrastructure development has not been accompanied by capacity building for digital literacy in local communities, so benefits remain limited. The observation aligns with Purwanto (2024) on the need for coordinated infrastructure development and inter-agency policy, and with Shafira et al. (2025) on the pedagogical dimensions of digital access in elementary education.

Public policy analysis also reveals that the success of physical policies does not always translate into substantive policy success. The government has been relatively successful in building telecommunications infrastructure, but oversight and human resource empowerment remain weak. The BTS 4G case provides empirical evidence of institutional failure in translating physical policy into social impact: a normatively good policy can fail to produce real change without integrity in political processes. The gap between infrastructure and pedagogy is especially damaging in remote regions, where teachers and students may have access but lack the training needed to integrate digital tools meaningfully into classroom practice.

Synthesis: Public Policy as the Root of Educational and Cultural Outcomes

Across the three dimensions, the initial hypothesis that "public policy and political dynamics shape Indonesia's intellectual and technological trajectory" is empirically supported. Low PISA scores, uneven education funding, dominance of imported products, and uneven internet access are not separate events but consequences of systemic failures in policy and political processes. Through Dye's (2012) framework, these problems shift from being mere socio-economic issues (limited facilities, digital gaps) to failures of political institutions, processes, and behaviour: inefficient budget allocation, weak transparency, lax import regulation, and corruption that disrupts programme implementation. The reframing matters because it relocates responsibility from students and teachers (often blamed for poor outcomes) to the policy system that sets the terms under which they work. Figure 1 summarises this cyclical relationship.

Figure 1. Cyclical Model of Public Policy Failure, Educational Quality, and Digital Culture in Indonesia

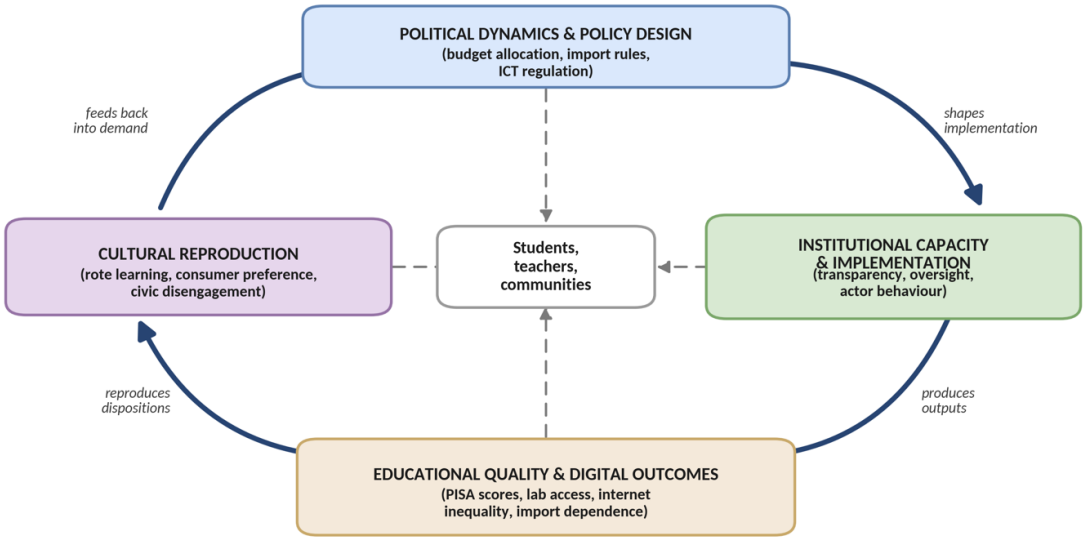

Table 4 presents the thematic mapping of qualitative codes against Dye's three dimensions, derived from Braun and Clarke's (2006) reflexive thematic analysis. Five overarching themes were identified, with 14 sub-themes drawn from the six interview transcripts.

Table 4. Thematic Mapping of Qualitative Findings to Dye's (2012) Public Policy Framework

Dye's Dimension	Theme	Sub-themes	Illustrative Informant
Socio-Economic Conditions (Inputs)	Pedagogical scarcity	Absent laboratories; thin libraries; pandemic learning loss	Informant 1; Informant 5
Socio-Economic Conditions (Inputs)	Geographic digital divide	Signal-hunting practices; rural-urban literacy gap; Papua isolation	Informant 3; Informant 5
Institutions, Processes, Behaviour (Conversion)	Opaque fund governance	Fictitious student reporting; PKBM misappropriation; weak oversight	Informant 2; Informant 6
Institutions, Processes, Behaviour (Conversion)	Implementation bias	BAKTI BTS 4G case; uneven tower distribution; suspended maintenance	Informant 6
Public Policy (Outputs and Culture)	Cultural reproduction of dependence	Preference for imported brands; rote-learning normalisation; civic disengagement	Informant 4; Informant 1

Note. PKBM = Pusat Kegiatan Belajar Masyarakat (Community Learning Activity Centre); BAKTI = Badan Aksesibilitas Telekomunikasi dan Informatika; BTS = Base Transceiver Station

These findings contribute to Indonesian public policy and education literature by uniting four issues previously studied separately under a single causal framework. Epistemologically, the study extends Fuady (2018) and Maslan (2014) by showing that digital inequality is not only an economic issue but a political one reproduced by policies biased along geographic and social lines. The reproduction of bias has cultural consequences as well, because it sustains uneven participation in the national imagination of technological modernity.

Beyond structural reform, three pedagogical implications follow. First, the persistence of rote-based learning across regions shows that curriculum reforms alone are insufficient. Teachers need sustained professional development, supportive institutional cultures, and adequate infrastructure to translate the Kurikulum Merdeka into genuinely inquiry-based classroom practice. In concrete terms, the absence of laboratory facilities reported by 50% of student respondents requires modifications to instructional design that go beyond textbook learning: teachers in laboratory-poor schools should be equipped with low-cost virtual-laboratory platforms (e.g., PhET Interactive Simulations), open-source data sets for science and mathematics inquiry, and modular project-based learning kits aligned with the Kurikulum Merdeka's phase-based competency descriptors. Second, the geographical heterogeneity of digital access means that digital pedagogy cannot be implemented uniformly. In Papua and other 3T regions, blended-learning models that combine offline resources with targeted online content are more pedagogically realistic than purely digital approaches. Third, the cultural dimension of technological dependence calls for a deliberate effort to cultivate a culture of innovation within schools, for example through project-based learning that encourages students to design locally relevant technological solutions. Embedded within coherent public policy, such interventions can

transform the relationship between citizens and technology from passive consumption to active production.

Targeted policy instruments derived from these findings are summarised in Table 5. Rather than restating generic principles, the table maps each empirical finding to a specific instrument that addresses the four interconnected failures identified in the study.

Table 5. Targeted Policy Recommendations Mapped to Empirical Findings

Empirical Finding	Targeted Policy Instrument	Lead Agencies
12% of schools misuse BOS funds (KPK, 2025); 44.1% of respondents are uncertain about budget oversight	Mandatory real-time public dashboard of school-level BOS expenditure with citizen feedback channel; community oversight committees with formal authority	Kemendikdasmen, KPK, BPK
6.76% internet penetration in Highland Papua and 28.71% in Central Papua against 84.69% in Java (BPS, 2025)	Conditional digital-inclusion grants tied to teacher digital-literacy certification; offline-first learning content distributed via SATRIA-1 satellite	BAKTI Kominfo, Kemendikdasmen
68.1% rate import regulations as too lax; 78% see weak local-product protection (Table 3)	Risk-based import inspection at archipelagic entry points; tax incentives for domestic R&D in priority technology sectors	Kemenkeu, Kemenperin, Bea Cukai
Absence of labs in 50% of sampled schools; rote learning in 54.6% of cases	Low-cost virtual laboratory rollout (e.g., PhET); modular project-based kits aligned with Kurikulum Merdeka; teacher professional learning communities	Kemendikdasmen, BSKAP, LPMP
Implementation bias in BTS 4G programme; IDR 8.03 trillion state loss (BPKP, 2023)	Independent technical audits before serah-terima; criminal accountability for serah-terima fraud; whistle-blower protection	BPK, BPKP, KPK, Kejaksaan Agung

CONCLUSION

Intellectual underdevelopment and slow technological innovation in Indonesia are direct consequences of systemic failures in public policy and political processes rather than of student or teacher deficiency. The four problems (low PISA scores, inequitable education funding, import dependence, and uneven internet access) are interconnected: non-adaptive and inequitable policy design, institutional weakness and corruption, and socio-economic barriers reinforce one another in a causal and cyclical relationship, in which political dynamics shape the institutions and processes that in turn produce structurally unequal policies and a widening cultural divide between urban and rural communities. Theoretically, the study affirms and extends Dye's Public Policy Theory for developing-country contexts through attention to interregional administrative asymmetry, informal sub-national actor behaviour, and cultural reproduction; practically, it shows that raising educational quality and technological innovation requires political reform that strengthens institutional integrity, process transparency, and public-actor accountability, with targeted instruments set out in Table 5. The main limitations are the national focus, which does not examine provincial heterogeneity in depth, and the small qualitative sample; future research should pursue comparative provincial and longitudinal studies, triple-helix collaboration among government, industry, and academia, and classroom-level observation of how policy failures manifest in teaching. Realising Indonesia's 2045 aspiration of a knowledge-based economy therefore demands not only policy reform but deliberate investment in the cultural foundations of learning, innovation, and civic engagement.

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AI Usage Declaration
During the preparation of this manuscript, the authors used AI-assisted tools, namely Claude (Anthropic) and Grammarly, for language editing, grammar and spelling correction, and improving the clarity and readability of the English text. These tools were not used to generate, collect, analyse, or interpret the study's data, nor to produce, select, or verify any references; all citations were checked manually against their original sources. After using these tools, the authors reviewed and edited the resulting text as needed and take full responsibility for the integrity, accuracy, and originality of the published work. No AI tool is listed as an author, and none meets the criteria for authorship.

Author Contribution Statement
The authors confirm their contributions to this article as follows: **Nabila Marsha Safitri:** Conceptualization, Methodology, Investigation, Formal analysis, Writing - original draft, Project administration. **Rizky Wahyu Hijazy:** Investigation, Data curation, Formal analysis, Writing - original draft. **Syaisa Ayurid Mihrain:** Investigation, Data curation, Validation, Writing - review & editing. **Muhammad Andi Septiadi:** Methodology, Software (statistical and qualitative analysis), Validation, Visualization. **Muhammad Fadhil Hadziq:** Supervision, Validation, Writing - review & editing.

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