



Volume 1, Issue 2, August 2026

e-ISSN: XXXX-XXXX

Prompt Engineering Curriculum Policy for Bridging Indonesia's AI Learning Divide

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ARTICLE INFO

Article History

Received:

21 July 2026

Accepted:

29 August 2026

Published:

30 August 2026

Keywords

Prompt Engineering;
Artificial Intelligence;
Digital Divide;
Education Policy.

Kata Kunci

Prompt Engineering;
Kecerdasan Artifisial;
Kesenjangan Digital;
Kebijakan Pendidikan;

ABSTRACT

Artificial intelligence is entering Indonesian schools faster than curriculum governance, teacher capacity, and digital infrastructure can adapt, creating a new learning divide between students who can use generative AI critically and those who can only access it superficially. This study formulates a public policy framework for integrating prompt engineering into primary and secondary education while protecting educational equity, learner agency, and data rights. A normative-juridical and policy-analysis design was applied by reviewing national education regulations, the 2025 Coding and Artificial Intelligence curriculum policy, official implementation guidance, and established scholarship on digital inequality, technological pedagogical content knowledge, computational thinking, and human-centered AI. The analysis identifies three policy risks: unequal school readiness, insufficient teacher competence for pedagogical AI use, and the possibility that prompt use becomes mechanical rather than intellectually meaningful. The proposed framework therefore combines differentiated delivery modes, age-appropriate prompt literacy, competency-based teacher development, privacy and academic-integrity safeguards, and a phased implementation roadmap from 2026 to 2032. Prompt engineering is positioned not as a stand-alone technical subject but as a structured inquiry skill embedded within coding and artificial intelligence learning. The study contributes an equity-oriented governance model that links curriculum standards, infrastructure support, teacher professional learning, assessment, and continuous policy evaluation so that AI-supported education expands opportunity rather than reproducing existing digital inequalities.

ABSTRAK

Kecerdasan artifisial memasuki sekolah-sekolah di Indonesia lebih cepat dibandingkan kemampuan tata kelola kurikulum, kapasitas guru, dan infrastruktur digital untuk beradaptasi, sehingga memunculkan kesenjangan belajar baru antara peserta didik yang mampu menggunakan AI generatif secara kritis dan mereka yang hanya dapat mengaksesnya secara dangkal. Penelitian ini merumuskan kerangka kebijakan publik untuk mengintegrasikan prompt engineering ke dalam pendidikan dasar dan menengah dengan tetap melindungi pemerataan pendidikan, kemandirian belajar, dan hak atas data pribadi. Penelitian menggunakan desain yuridis normatif dan analisis kebijakan melalui telaah regulasi pendidikan nasional, kebijakan Koding dan Kecerdasan Artifisial tahun 2025, pedoman implementasi resmi, serta literatur mengenai kesenjangan digital, technological pedagogical content knowledge, berpikir komputasional, dan human-centered AI. Analisis menemukan tiga risiko utama, yaitu ketimpangan kesiapan sekolah, keterbatasan kompetensi guru dalam penggunaan AI secara pedagogis, serta kecenderungan penggunaan prompt menjadi mekanis dan tidak memperkuat proses berpikir. Kerangka yang diusulkan menggabungkan moda pembelajaran terdiferensiasi, literasi prompt sesuai usia, pengembangan kompetensi guru, perlindungan privasi dan integritas akademik, serta peta jalan implementasi bertahap 2026-2032. Prompt engineering ditempatkan bukan sebagai mata pelajaran teknis yang berdiri sendiri, melainkan sebagai keterampilan inkuiri terstruktur yang terintegrasi dalam pembelajaran Koding dan Kecerdasan Artifisial. Kontribusi penelitian adalah model tata kelola

berorientasi keadilan yang menghubungkan standar kurikulum, dukungan infrastruktur, pengembangan profesional guru, asesmen, dan evaluasi kebijakan berkelanjutan agar pendidikan berbasis AI memperluas kesempatan belajar dan tidak memperkuat kesenjangan digital yang telah ada.

INTRODUCTION

Artificial intelligence has moved from a specialized computational technology into an everyday interface for learning, communication, and knowledge production. Generative systems can now explain concepts, draft text, translate material, generate code, and respond conversationally to student questions, which changes the practical meaning of digital literacy in schools. UNESCO (2023) therefore argues that education systems need human-centered governance capable of aligning pedagogical benefits with privacy, agency, inclusion, and age-appropriate use. In Indonesia, this challenge is especially significant because access to devices, connectivity, teacher expertise, and learning support remains uneven across regions and school types. Curriculum policy must consequently address not only whether students can access artificial intelligence, but also whether they can question, direct, verify, and use its outputs responsibly.

The emergence of prompt engineering creates a new layer of educational inequality because the value of generative AI depends partly on the quality of instructions that users can formulate. Prompting is more than typing a question, since effective interaction requires users to clarify goals, provide relevant context, specify constraints, evaluate responses, and refine subsequent instructions. White et al. (2023) show that structured prompt patterns can improve the reliability and usefulness of interactions with large language models, while Zamfirescu-Pereira et al. (2023) demonstrate that non-expert users often struggle to design prompts that consistently produce intended outcomes. Students with stronger language skills, digital experience, and guided practice are therefore more likely to benefit from generative AI than peers who encounter the same tools without instructional support. This difference transforms the traditional digital divide from a problem of access alone into a problem of cognitive and pedagogical capability.

Indonesia has begun to respond through the introduction of Coding and Artificial Intelligence as an optional subject within the national curriculum framework. The Ministry of Basic and Secondary Education (2025a) positions coding and artificial intelligence learning as a strategic effort to develop computational thinking, digital literacy, problem solving, and ethical technology use across developmental stages. The national curriculum information system further indicates that prompt engineering appears within the artificial intelligence learning profile at more advanced levels, where students are expected to use combinations of instructions appropriately while examining issues such as bias, hallucination, transparency, and sustainability (Ministry of Basic and Secondary Education, 2025b). This policy direction gives formal educational space to skills that are increasingly important for participation in AI-mediated environments. However, introducing a new competency does not automatically guarantee equitable or meaningful learning when schools begin from highly unequal conditions.

The equity problem is reinforced by differences in infrastructure and human resources across Indonesian educational settings. National implementation guidance recognizes this reality by allowing internet-based, plugged, and unplugged modes so that coding and artificial intelligence learning can be adapted to the resources available in each school (Ministry of Basic and Secondary Education, 2025c). This flexibility is important, yet it also creates a governance challenge because differentiated delivery can become differentiated quality when learning outcomes, teacher support, and assessment standards are not clearly defined. Schools with advanced connectivity may provide students with continuous access to commercial generative AI systems, while schools with limited devices may rely on simulations or teacher-mediated activities. Public policy must ensure that the mode of delivery differs without lowering the entitlement of students to develop equivalent critical, ethical, and computational competencies.

This study formulates a public policy framework for integrating prompt engineering into primary and secondary education as part of Indonesia's emerging coding and artificial intelligence curriculum. The research asks how prompt engineering can be defined educationally, how curriculum governance can prevent new forms of digital inequality, and which institutional safeguards are necessary for responsible implementation. The study treats prompt engineering as an inquiry and communication competency that should strengthen reasoning, metacognition, and verification rather than encourage dependence on machine-generated answers. It also examines how differentiated infrastructure, teacher development, student data protection, assessment, and intergovernmental coordination can be aligned within one implementation architecture. The contribution is a policy model that connects curriculum content with equity mechanisms, professional capacity, rights protection, and continuous evaluation so that artificial intelligence becomes a tool for educational inclusion rather than a multiplier of existing advantage.

LITERATURE REVIEW

Digital Inequality and Educational Capital

Digital divide theory provides the first analytical foundation for understanding why artificial intelligence can deepen educational inequality even when access expands. Norris (2001) distinguishes disparities in access, engagement, and democratic outcomes, while Warschauer (2004) emphasizes that meaningful inclusion depends on social resources, skills, institutions, and opportunities to convert technology into valued outcomes. These perspectives are highly relevant to generative AI because two students using the same application may obtain very different learning benefits depending on language proficiency, prior knowledge, teacher guidance, and confidence in evaluating outputs. The educational problem is therefore not solved by distributing devices or internet connections alone. Policy must address an AI learning divide that includes material access, operational skill, cognitive capability, pedagogical support, and the capacity to use technology for substantive educational advancement.

TPACK, Computational Thinking, and Prompt Literacy

The Technological Pedagogical Content Knowledge framework offers a second foundation by explaining how prompt engineering should be situated within classroom practice. Mishra and Koehler (2006) argue that technology becomes educationally meaningful when it is integrated with pedagogical strategies and disciplinary content, which implies that prompting should not be taught as a generic list of tricks. A history student may need prompts that support source comparison and contextual reasoning, while a science student may use prompts to generate hypotheses that must then be tested against empirical evidence. In language learning, prompting can support revision and feedback, but the pedagogical design should require learners to justify why they accept or reject the suggested changes. The TPACK perspective therefore redirects policy from teaching tool operation toward designing subject-specific inquiry in which students remain responsible for interpretation and judgment.

Computational thinking provides a third conceptual bridge because high-quality prompts often require decomposition, abstraction, sequencing, pattern recognition, and iterative refinement. Wing (2006) describes computational thinking as a way of formulating problems so that solutions can be represented through systematic processes, and these practices map closely onto structured interactions with generative AI. Students who break complex tasks into stages, identify necessary context, specify constraints, test outputs, and revise instructions are practicing a form of computational reasoning rather than merely consuming automated answers. This connection is important for curriculum design because it allows prompt engineering to reinforce existing educational goals instead of competing for additional curriculum time. Prompt literacy can therefore be embedded within problem-solving activities that already develop logical reasoning and disciplined inquiry.

Human-Centered AI and Responsible Learning

Human-centered artificial intelligence provides a normative foundation for preserving learner agency and educational purpose. Shneiderman (2020) argues that reliable and trustworthy AI should increase human control rather than replace human judgment, a principle that is particularly important when learners are still developing cognitive independence. In schools, the central question is not how to maximize AI use but how to design conditions in which technology supports reflection, feedback, creativity, and access without becoming the final authority on truth. Selwyn (2019) similarly cautions against technological solutionism in education because automation can narrow pedagogical relationships and obscure the political choices embedded in digital systems. Prompt engineering education should consequently include when not to use AI, how to recognize uncertainty, and how to maintain responsibility for decisions that affect learning and assessment.

Research on generative AI in education shows both substantial potential and serious risks that justify structured curriculum governance. Kasneci et al. (2023) identify opportunities for personalized support, feedback, tutoring, language assistance, and idea generation, while also emphasizing hallucination, bias, privacy, misinformation, and overreliance. Mollick and Mollick (2023) propose teaching approaches that use AI as a tutor, coach, teammate, student, simulator, or tool, but each approach requires clear human oversight and a learning objective that remains independent of the system's output. These studies indicate that effective use depends on task design rather than on the presence of the technology itself. A prompt engineering curriculum should therefore teach students to frame tasks, interrogate assumptions, request evidence, compare outputs, and document their own reasoning process.

Public Policy and Inclusive Curriculum Governance

Public policy theory adds an institutional dimension because curriculum reform requires coordination across regulatory levels, organizations, and implementation contexts. Dunn (2018) emphasizes that policy analysis should connect problem structuring, forecasting, recommendation, monitoring, and evaluation, while Cairney (2020) shows that implementation is shaped by institutions, actor networks, uncertainty, and bounded attention. Education policy for generative AI must accordingly move beyond a one-time curricular decision and establish a learning system that can adapt as models, platforms, and risks evolve. National government can define minimum competencies and rights safeguards, but local governments and schools need discretion to choose delivery modes that fit their infrastructure and learner profiles. The challenge is to combine standardization of outcomes with flexibility of implementation without allowing flexibility to become a justification for unequal quality.

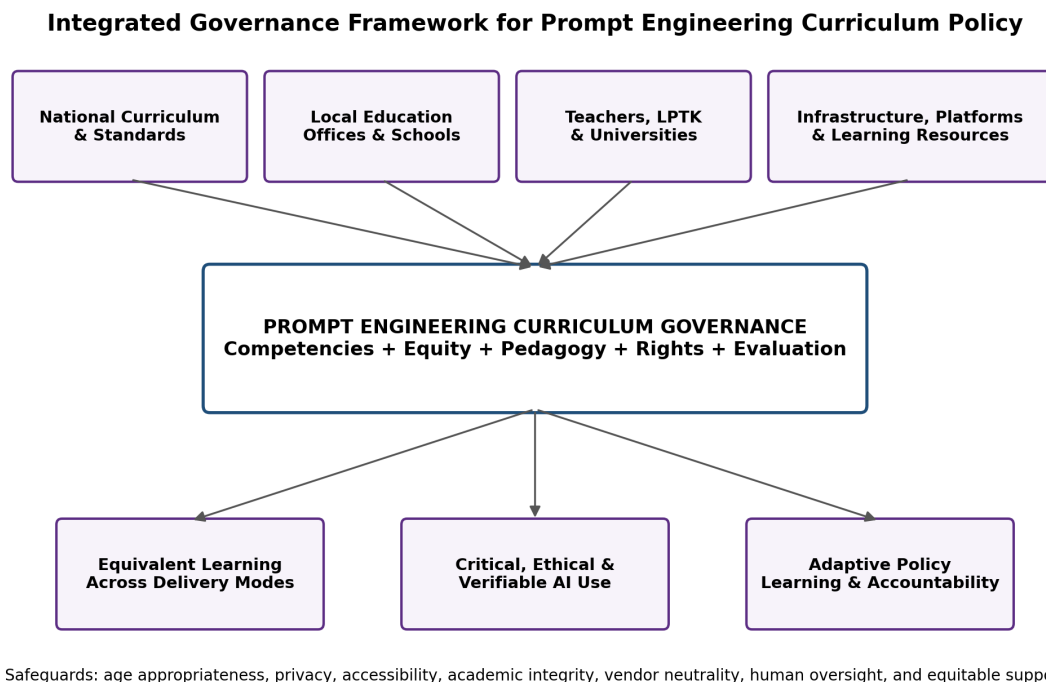


Figure 1. Integrated Governance Framework for Prompt Engineering Curriculum Policy

Source: Authors' formulation based on Mishra and Koehler (2006), Shneiderman (2020), UNESCO (2023), and Indonesian curriculum policy.

RESEARCH METHODS

This study uses a normative-juridical research design integrated with qualitative public policy analysis to formulate an implementable governance framework for prompt engineering in primary and secondary education. The normative component examines the relationship between constitutional educational obligations, the National Education System Law, personal data protection, and the 2025 curriculum policy that introduced Coding and Artificial Intelligence as an optional subject. The policy-analysis component assesses how curriculum standards, implementation guidance, teacher capacity, infrastructure differences, and ethical risks interact during implementation. Documentary materials include legislation, official curriculum information, ministerial academic and implementation guidance, international policy guidance, and peer-reviewed scholarship on artificial intelligence and education. The combined design is appropriate because the research question concerns both legal legitimacy and the institutional feasibility of translating an emerging competency into equitable public education.

Primary legal and policy materials were organized into a hierarchy consisting of constitutional mandates, national legislation, ministerial curriculum regulation, implementation guidance, and administrative program documents. The analysis gives particular attention to Law No. 20 of 2003 on the National Education System, Law No. 27 of 2022 on Personal Data Protection, Minister of Basic and Secondary Education Regulation No. 13 of 2025, and Ministerial Decree No. 127/P/2025 on implementation guidance for Coding and Artificial Intelligence. Secondary materials include UNESCO guidance, theoretical literature on digital inequality and technology integration, and empirical research on generative AI use in education. Each source was coded according to five policy dimensions: educational purpose, equity, teacher capacity, learner protection, and institutional accountability. This coding structure enabled the study to identify where current policy already provides a foundation and where additional governance instruments are needed for prompt engineering.

The manuscript's existing educational readiness profile was retained as an internal analytical dataset rather than treated as a nationally representative survey. The profile classifies 155

educational units into high, moderate, and low readiness categories, allowing the analysis to examine how a single curriculum requirement may produce different implementation conditions across schools. Because the original manuscript does not document a probability sampling design, the figures are interpreted as a policy scenario that illustrates readiness variation rather than as estimates of national prevalence. This methodological clarification prevents overgeneralization while preserving the empirical pattern that motivated the original policy formulation. The readiness profile is then triangulated conceptually with official guidance that explicitly permits internet-based, plugged, and unplugged implementation modes in response to different resource conditions.

RESULTS AND DISCUSSION

Policy Foundation and Educational Definition

The first finding is that Indonesia now has a stronger formal policy basis for artificial intelligence learning than the original manuscript suggested, but prompt engineering remains an emerging competency within that broader architecture. Minister of Basic and Secondary Education Regulation No. 13 of 2025 added Coding and Artificial Intelligence as an optional subject that schools may provide according to their resources and students may select according to interest (Ministry of Basic and Secondary Education, 2025b). Official curriculum materials further identify the appropriate combination of instructions, or prompt engineering, as part of the artificial intelligence learning profile at advanced stages. This means prompt literacy does not require an entirely separate national subject, because it can be developed within an existing curricular pathway. The policy problem is therefore how to operationalize prompt engineering consistently, equitably, and pedagogically within the flexibility already permitted by the curriculum.

The second finding concerns the educational definition of prompt engineering because policy design depends on what the curriculum is actually intended to produce. A narrow definition treats prompting as a technique for making artificial intelligence provide better answers, whereas an educational definition treats it as a structured process of framing problems, communicating constraints, evaluating evidence, and revising instructions. The second definition is more compatible with computational thinking, TPACK, and human-centered AI because it maintains students' responsibility for reasoning rather than rewarding output optimization alone (Mishra & Koehler, 2006; Shneiderman, 2020; Wing, 2006). Curriculum standards should therefore assess whether students can explain why they constructed a prompt in a particular way and how they evaluated the response. This approach reduces the risk that prompt engineering becomes another form of procedural memorization disconnected from deeper learning.

The third finding is that prompt literacy should be differentiated by developmental stage rather than introduced as one uniform technical skill. At the upper-primary level, students can learn task decomposition, question clarity, and simple comparisons through teacher-mediated or simulated activities without needing unrestricted access to public generative AI systems. At lower-secondary level, learners can practice adding context, constraints, examples, and verification steps while discussing bias, hallucination, privacy, and academic honesty. At upper-secondary level, students can use more complex iterative prompts for research, coding, data interpretation, creative production, and disciplinary problem solving while documenting sources and human decisions. This staged progression aligns with official coding and artificial intelligence guidance that emphasizes age-appropriate learning and multiple implementation modes (Ministry of Basic and Secondary Education, 2025c).

Table 1
Policy, Legal, and Conceptual Basis for Prompt Engineering Integration

Policy / Framework	Core Relevance	Implication for Curriculum Governance
Law No. 20 of 2003 on the National Education System	Establishes national obligations for equitable and quality education.	AI curriculum implementation must expand educational opportunity and remain consistent with national learning purposes.
Permendikdasmen No. 13 of 2025	Adds Coding and Artificial Intelligence as an optional subject in the national curriculum.	Prompt engineering can be embedded within the existing AI learning pathway rather than introduced as a separate subject.
Ministerial Decree No. 127/P/2025	Allows internet-based, plugged, and unplugged implementation suited to available resources.	Equivalent competencies should be achievable through differentiated delivery modes.
Law No. 27 of 2022 on Personal Data Protection	Protects personal data and establishes responsibilities for lawful processing.	School AI use requires data minimization, tool review, age-appropriate safeguards, and student privacy literacy.
TPACK and Human-Centered AI	Links technology to pedagogy and content while preserving human control and responsibility.	Prompt literacy should strengthen inquiry, verification, and subject learning rather than automate student thinking.

Source: Authors' compilation from national regulations and established theoretical frameworks.

Readiness, Equity, and Differentiated Delivery

The fourth finding is that the readiness variation contained in the source manuscript demonstrates why a uniform implementation mandate would create unequal educational experiences. Within the analytical dataset of 155 educational units, 42 units are categorized as highly ready, 68 as moderately ready, and 45 as having low readiness, corresponding to 27.1%, 43.9%, and 29.0% respectively. The pattern suggests that most schools would need some combination of infrastructure, teacher development, or curricular support before they could deliver sophisticated AI-supported learning consistently. Importantly, low readiness should not be interpreted as low learner potential because the barrier is institutional capacity rather than student ability. Equity policy must therefore direct stronger public support toward schools with weaker starting conditions rather than delay their participation indefinitely.

The fifth finding is that differentiated delivery modes can become an equity mechanism when they are tied to equivalent learning outcomes. Official implementation guidance permits internet-based, plugged, and unplugged modes, which allows schools to teach computational and AI concepts even when continuous connectivity is unavailable (Ministry of Basic and Secondary Education, 2025c). For prompt engineering, unplugged activities can include rewriting ambiguous instructions, comparing alternative question structures, role-playing an AI response process, and identifying missing context before students interact with an actual system. Plugged but offline activities can use locally stored examples or teacher-prepared model outputs for critique, while internet-based activities can involve live iterative prompting with carefully selected tools. The policy standard should therefore define what students must learn, while allowing schools to choose the safest and most feasible mode for achieving the competency.

Table 2*Analytical Educational Unit Readiness Profile for AI Learning Integration (N = 155)*

Readiness Category	Number of Units	Percentage	Policy Interpretation
High: infrastructure and human resources substantially prepared	42	27.1%	Can serve as early implementation sites, but should not define assumptions for all schools.
Moderate: infrastructure available, human resources or pedagogy still limited	68	43.9%	Requires targeted teacher development, implementation support, and staged classroom integration.
Low: facilities and teacher capacity substantially constrained	45	29.0%	Requires affirmative resource support and viable plugged or unplugged learning pathways before advanced online use.
Total	155	100.0%	The dataset is used analytically and is not presented as a nationally representative estimate.

Source: Analytical profile retained from the source manuscript and interpreted with methodological caution in this study.

Teacher Capacity, Assessment, and Responsible Use

The sixth finding is that teacher professional development must combine AI literacy with pedagogical design rather than rely on short technical workshops. Teachers need to understand how generative models respond probabilistically, why hallucinations occur, how prompts can encode assumptions, and when student data should not be entered into external systems. They also need subject-specific strategies for turning AI outputs into objects of critique, comparison, revision, and reflection rather than answer keys. A TPACK-based professional learning pathway can organize these requirements by connecting technological concepts with disciplinary goals and classroom methods (Mishra & Koehler, 2006). Certification should therefore assess the teacher's capacity to design and facilitate an AI-supported learning sequence, not merely the ability to operate a platform.

The eighth finding concerns curriculum integrity because generative AI can blur the distinction between assistance, authorship, and substitution. If students are assessed only on polished final products, prompt engineering may make it easier to outsource intellectual work without developing the underlying knowledge that the assignment was intended to measure. Assessment must therefore place greater weight on process evidence, oral explanation, source verification, drafts, reflection, and the student's ability to reproduce key reasoning without AI assistance. Mollick and Mollick (2023) emphasize that AI roles should be explicitly designed within learning activities so that the technology supports rather than replaces cognition. Clear disclosure rules can normalize legitimate assistance while making hidden substitution easier to identify and discuss.

The ninth finding is that verification should be treated as a core prompt literacy competency rather than an optional warning about hallucinations. Students need routines for checking factual claims against trusted sources, distinguishing generated explanations from evidence, identifying uncertainty, and asking the system to expose assumptions or alternative interpretations. UNESCO (2023) recommends human-centered educational use that includes validation of pedagogical and ethical suitability, which supports a curriculum that teaches skepticism and verification alongside productive use. Verification tasks can be adapted across subjects, such as checking historical dates, testing mathematical reasoning, reviewing scientific claims, or comparing generated policy

arguments with official documents. The goal is to make the learner the final evaluator of knowledge claims rather than the recipient of authoritative-sounding machine text.

The tenth finding is that data protection requires explicit curriculum and administrative safeguards because students may disclose sensitive personal information while experimenting with conversational systems. Law No. 27 of 2022 establishes a national legal basis for personal data protection, while UNESCO (2023) specifically warns that generative AI adoption can expose learners to privacy risks when educational institutions lack clear governance. Schools should prohibit the entry of unnecessary personal data, confidential school records, health information, identifiers, or information about other students into external AI services. Administrators should also conduct tool-level risk assessment covering data retention, account requirements, age restrictions, third-party processing, and available privacy controls. Data literacy should be taught as part of prompt literacy so that students understand that every useful detail added to a prompt may also create a privacy exposure.

The eleventh finding is that age appropriateness must shape both access and instructional expectations. Younger students can develop prompt-related reasoning through teacher mediation, structured examples, and unplugged activities without independent access to general-purpose conversational AI. Older students can receive progressively greater autonomy when they demonstrate understanding of verification, privacy, bias, citation, and responsible disclosure. UNESCO (2023) recommends age-appropriate approaches and human oversight, which supports a graduated model rather than a single access rule for all learners. Schools should also provide equivalent alternatives when parents or learners cannot use a particular tool because of age, disability, privacy concerns, language limitations, or account requirements.

Table 3

Age-Appropriate Prompt Engineering Competency Progression

Education Stage	Prompt Literacy Focus	Critical and Ethical Focus	Suggested Delivery
Upper Primary / Phase C	Clarifying tasks, identifying missing information, sequencing simple instructions, comparing two formulations.	Recognizing that AI can be wrong, protecting personal information, distinguishing own work from machine suggestions.	Primarily teacher-mediated, unplugged, or controlled plugged activities; limited direct use.
Lower Secondary / Phase D	Adding context, constraints, examples, iteration, and basic role or format instructions.	Checking claims, recognizing bias and hallucination, citing sources, explaining revisions and AI assistance.	Plugged and supervised internet-based activities combined with critique of prepared outputs.
Upper Secondary / Phases E-F	Multi-step prompting, disciplinary inquiry, coding support, structured research questions, comparative output analysis.	Verification, academic integrity, privacy, model limitations, transparent disclosure, and independent decision justification.	Internet-based, plugged, and project-based use with strong process documentation and alternative pathways.

Source: Authors' formulation based on national Coding and Artificial Intelligence guidance, UNESCO (2023), and the TPACK framework.

Governance, Procurement, and Implementation Sequencing

The thirteenth finding is that intergovernmental coordination is necessary because curriculum policy is national while implementation capacity is distributed across provinces, municipalities, districts, and individual schools. National authorities should define competency outcomes, ethical minimums, assessment principles, and national teacher-development standards, while local education offices should map readiness and allocate support according to school conditions. Schools need operational discretion to select delivery modes, organize schedules, and integrate

prompt literacy into subject learning, but this discretion should be bounded by minimum student rights and quality standards. Public reporting can make disparities visible by showing teacher certification, infrastructure availability, learning participation, and implementation obstacles without ranking schools solely by resource wealth. This division of responsibilities combines national equity guarantees with local adaptability.

The sixteenth finding concerns policy sequencing because immediate nationwide implementation could amplify readiness disparities even when the long-term goal is universal capability. A 2026 baseline phase should map teacher competence, school connectivity, device access, existing coding and artificial intelligence provision, and local support institutions before additional prompt engineering requirements are formalized. A 2027 standards phase can then establish competency descriptors, teaching modules, assessment guidance, privacy rules, and training benchmarks based on the baseline. From 2028 onward, teacher development and differentiated pilots should proceed in parallel so that policy learning occurs before nationwide consolidation. This sequencing converts implementation into a managed learning process rather than assuming that curriculum adoption alone produces capability.

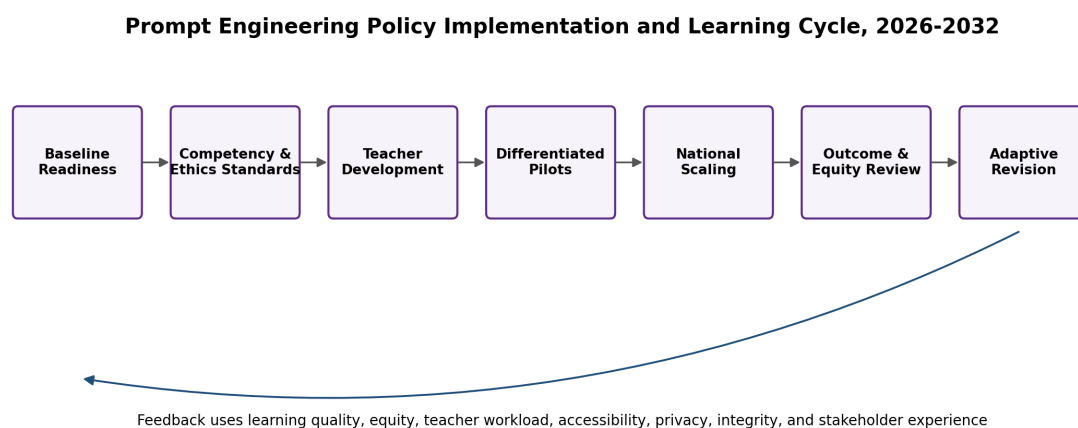


Figure 2. Prompt Engineering Policy Implementation and Learning Cycle, 2026-2032

Source: Authors' formulation (2026).

The eighteenth finding is that evaluation must measure learning quality rather than count technology use. Indicators such as the number of prompts submitted, accounts created, or lessons using AI can show activity but cannot demonstrate whether students developed stronger reasoning or more equitable opportunities. More meaningful indicators include the ability to formulate clear problems, identify missing information, compare alternative prompts, verify claims, disclose AI assistance, protect sensitive data, and explain final decisions in the student's own words. Evaluation should also compare outcomes across gender, disability, region, school readiness, and socioeconomic context to detect whether the policy is narrowing or widening educational gaps. These indicators align the program with educational public value rather than with digital adoption as an end in itself.

The twentieth finding is that the strongest governance design combines standardization, differentiation, and continuous policy learning. Standardization is needed for minimum competencies, student rights, teacher expectations, and accountability so that location does not determine the quality of educational entitlement. Differentiation is needed for infrastructure modes, local language, accessibility, subject integration, and pacing so that implementation remains feasible across diverse settings. Continuous policy learning is needed because generative AI systems, risks, and educational practices will change faster than conventional curriculum revision cycles. The proposed model therefore treats prompt engineering policy as an adaptive

public service system whose purpose is to expand human capability rather than to maximize exposure to artificial intelligence. This adaptive arrangement also gives government a practical basis for revising teacher support, resource allocation, assessment rules, and privacy safeguards whenever implementation evidence shows that specific learner groups remain educationally disadvantaged.

Table 4

Phased Implementation Roadmap for Equitable Prompt Engineering Integration, 2026-2032

Period	Priority Actions	Responsible Actors	Equity and Rights Safeguards	Key Indicators
2026	National and regional readiness mapping; inventory of teacher competence, connectivity, devices, current AI learning, and accessibility needs.	Ministry, provincial and local education offices, schools, universities.	No school excluded from baseline; data collected proportionally and without unnecessary student identifiers.	100% participating regions mapped; readiness gaps publicly summarized.
2027	Competency descriptors, teaching modules, assessment guidance, tool-use rules, privacy standards, and reviewed exemplar lessons.	Curriculum authorities, teacher education institutions, educators, legal and ethics experts.	Vendor-neutral standards; age-appropriate requirements; accessibility and non-AI alternatives defined.	National guidance issued; modules cover internet, plugged, and unplugged modes.
2028-2029	Large-scale teacher professional development and stratified pilots across high-, moderate-, low-readiness, urban, rural, and 3T contexts.	Teacher development agencies, local governments, LPTK, pilot schools.	Additional support targeted to low-readiness schools; pilot design includes disability and language inclusion.	Teacher certification, participation equity, learning quality, workload, and privacy incidents monitored.
2030	Gradual scaling of validated curriculum and support packages with differentiated resource allocation.	National and regional government, education offices, schools.	Funding formula accounts for readiness gaps; no mandatory household purchase of commercial AI access.	Coverage, learning outcomes, access gaps, and equivalent competency achievement reported.
2031-2032	Independent impact evaluation, regulatory review, curriculum updating, procurement revision, and institutionalization of adaptive governance.	Ministry, universities, independent evaluators, audit bodies, stakeholder forums.	Evaluation disaggregated by region, gender, disability, and socioeconomic context; complaint trends reviewed.	Evidence of narrowed AI learning gaps, stronger verification skills, safe data practices, and timely corrective action.

Source: Authors' formulation based on the source manuscript's 2026-2032 concept and updated national implementation architecture.

CONCLUSION

This study concludes that integrating prompt engineering into Indonesian primary and secondary education is justified when the competency is defined as structured inquiry rather than as a collection of techniques for obtaining better machine outputs. The 2025 Coding and Artificial Intelligence curriculum policy already provides an institutional entry point, including age-appropriate learning, multiple delivery modes, and a formal place for prompt engineering within advanced artificial intelligence competencies. The principal policy challenge is therefore not whether prompting belongs in education, but how government can ensure that differences in infrastructure, teacher capacity, language, disability, and household resources do not become

differences in learning entitlement. An equity-oriented design requires national minimum standards, differentiated implementation, sustained teacher professional development, student data protection, verification practices, and assessment that preserves independent reasoning. Prompt literacy should ultimately strengthen students' capacity to ask better questions, test information, explain decisions, and use artificial intelligence without surrendering cognitive responsibility.

The proposed governance framework links curriculum standards with readiness mapping, teacher development, accessible infrastructure, vendor-neutral procurement, age-appropriate safeguards, and continuous evaluation. National authorities should define competencies and rights, local education offices should target support based on readiness, and schools should adapt delivery while remaining accountable for equivalent learning outcomes. Pilot implementation should deliberately include low-readiness and 3T contexts so that curriculum design is tested against the conditions where educational inequality is most likely to emerge. Evaluation should measure reasoning, verification, privacy, accessibility, and distributional effects rather than simply counting AI use. Through this arrangement, prompt engineering can become part of an inclusive public education strategy that expands digital capability while keeping learners, teachers, and democratic educational purposes at the center of technological change.

Future research should test the framework empirically across different school types and regions because the readiness profile used in this article is an analytical dataset rather than a nationally representative sample. Comparative studies could examine how internet-based, plugged, and unplugged prompt literacy activities affect reasoning, teacher workload, student confidence, and learning outcomes under different resource conditions. Longitudinal research is also needed to determine whether early prompt literacy produces durable information-evaluation skills or merely short-term familiarity with current generative AI interfaces. Policy evaluation should further investigate whether privacy rules, academic-integrity standards, and accessibility measures are understood consistently by students and teachers. These evidence needs are important because responsible AI curriculum governance must remain open to revision as technologies, educational practices, and social expectations continue to evolve.

ACKNOWLEDGEMENT

The authors acknowledge the contributions of Monica Natalie Irene, Ocha Ilvi Kamalia, Muhammad Sifak Nurhidayatullah, Maia Sabti Syaro, Albaitul Khoiridah, Herdiyanto Fransiskus Samosir, Revalina Azmi Zazkiah, and Felia Noorlibna Badzlin, who supported the preparation and discussion of the original article. Their input assisted the authors in identifying practical issues related to educational technology, student learning, and policy implementation. The authors also appreciate the academic environment of the Department of Public Administration, Universitas Negeri Surabaya, which encouraged the development of the policy perspective used in this study. Responsibility for the analysis, interpretation, and final formulation remains with the listed authors. No external funding was received specifically for the preparation of this article.

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