



Nordic education policy construction as a model for reforming Indonesia's national education system towards SDG-based digital transformation

Dhofarina Firda Kamala¹, Dinda Ayu Halimatus Sa'diyah^{1,*}, Nur Jihan¹

¹ *Departement of Constitutional Law, Faculty of Sharia and Law, Universitas Islam Negeri Sunan Ampel Surabaya, Surabaya, East Java 60237, Indonesia.*

*Correspondence: dindaayuhs@gmail.com

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ABSTRACT

Background: Digital transformation in education has become a strategic necessity in the era of Society 5.0, where technology serves not only as an industrial tool but also as a means to improve the quality of human life and support environmental sustainability. Indonesia's commitment to SDG 4 (Quality Education) and SDG 13 (Addressing Climate Change) demands a governance approach that integrates equitable digital education with environmental literacy and ecological citizenship. **Methods:** Using qualitative research methods with a literature review approach through analysis of policy documents, academic journals, international reports, and relevant national regulations. The results show that Finland's success in digital education transformation is supported by long-term policy stability, research-based curriculum updates, coordinated decentralization, teacher readiness as key actors, equitable digital infrastructure, strict data protection, and the explicit integration of sustainability and environmental literacy competencies into the learning process. **Findings:** The results show that Finland's success is supported by long-term policy stability, research-based curriculum renewal, coordinated decentralization, teacher readiness as key actors, equitable digital infrastructure, and strict data protection. In contrast, Indonesia still faces challenges in the form of overly rapid curriculum changes, inconsistent policy direction, infrastructure gaps, and low digital competence among some educators. **Conclusion:** This study concludes that Indonesia can achieve an inclusive, adaptive, and sustainable digital education transformation through long-term policy consistency, multi-stakeholder collaboration, and the integration of local values as the foundation for national policy development. **Novelty/Originality of this article:** This study offers a policy reformulation model in the form of a Grand Design for Digital Education Transformation and the establishment of INDEC as a data-based national evaluation and coordination center.

KEYWORDS: curriculum reform; digital transformation; education policy; Indonesia; Scandinavia society 5.0; environmental governance; sustainability governance.

1. Introduction

The continuously evolving era of globalization, driven by rapid technological advancement, has given rise to the digital-native generation, or Generation Z, a group born and raised in an environment shaped by digital technology such as the internet and social media. Curriculum changes in Indonesia occur at a relatively fast pace; therefore, operational curricula in educational institutions must remain dynamic in order to adapt to cultural shifts, technological developments, and the ever changing demands of the modern era (Wulandari, 2022). One noteworthy phenomenon in this context is the emergence of Society 5.0. The concept of "Society 5.0," introduced by former Japanese Prime Minister Shinzo Abe, illustrates

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an evolutionary stage of society in which technology functions not only as an industrial tool but also as a means to enhance human well-being. Following the eras of agriculture (Society 1.0), industrialization (2.0), the internet (3.0), and the integration of artificial intelligence into industry (4.0), Society 5.0 places humans at the center of technological progress (Marketing, 2023). Collaboration between social scientists and technology researchers in Indonesia has the potential to strengthen empirical studies on the application of artificial intelligence in education, supporting efforts to ensure more equitable and accessible learning opportunities (Rohayati & Abdillah, 2024).

According to data from the Central Statistics Agency/*Badan Pusat Statistik (BPS)* in 2024, Indonesia's internet penetration rate has reached approximately 82.05%, showing a significant increase compared to 72.78% in the previous year. This achievement indicates that the fundamental infrastructure required for digitalization along with the use of modern technologies such as big data, the Internet of Things (IoT), and artificial intelligence (AI) is increasingly available, although distribution remains uneven across regions. Indonesia's digital transformation aligns with the characteristics of Society 5.0, in which digital progress is not solely focused on technological aspects but also considers social, educational, and societal dimensions. As a result, the transformation process must be realized through cross-sector collaboration to ensure that its implementation is inclusive and sustainable (Rohayati & Abdillah, 2024). The following figure presents the trend of Indonesia's national internet penetration rate based on official Central Statistics Agency/*Badan Pusat Statistik (BPS)* data, contextualizing the growth trajectory discussed above.

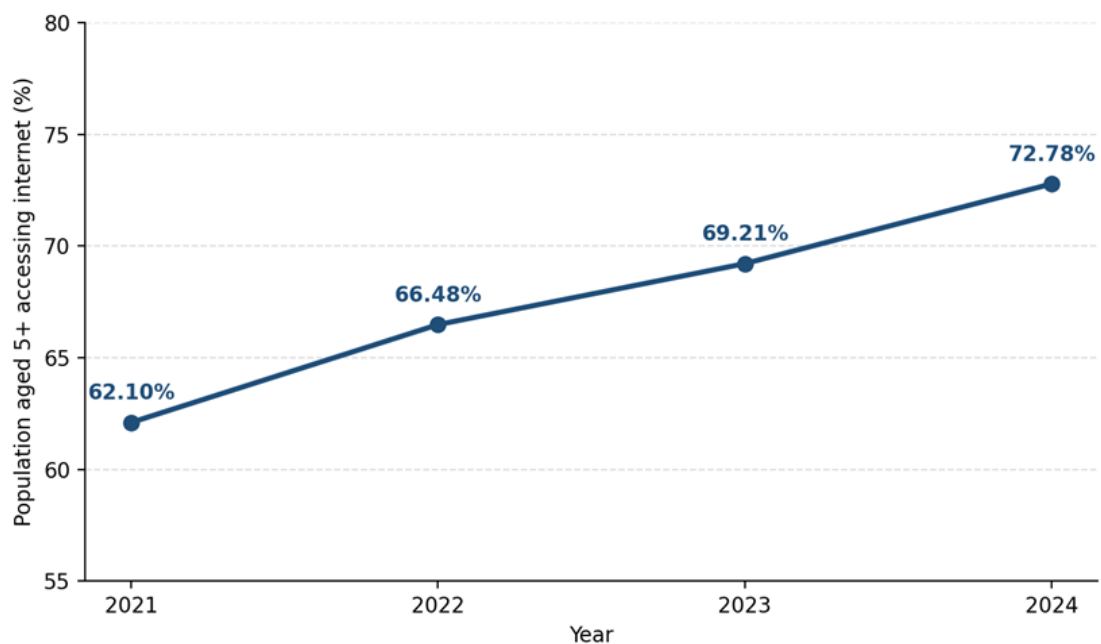


Fig. 1. Indonesia's national internet penetration rate, 2021–2024

The rapid development of digital transformation has significantly influenced various sectors, including education. In Indonesia, digitalization has begun to reshape learning patterns, teaching methods, and the management of educational systems, creating opportunities for more innovative, adaptive, and inclusive learning experiences. Scandinavian countries especially Finland are often viewed as global references for their success in integrating digital technology into education. Over recent decades, Finland has transformed its educational system into one of the best in the world. Based on the 2015 Programme for International Student Assessment (PISA) conducted by the OECD, Finland ranked among the top-performing countries in science, reading, and mathematics, while Indonesia remained among the lowest-performing nations (Suyono et al., 2023). In Finland, teachers serve not only as instructors but also as curriculum designers and experts, with each

school having the autonomy to develop its own curriculum according to students' needs while still adhering to national guidelines.

Although countries such as Finland have succeeded in establishing well-structured educational systems grounded in humanistic values, Indonesia continues to face major challenges in realizing effective and equitable digital education transformation. One of the key issues is the frequent changes in curriculum without comprehensive evaluation, leading to uncertainty in the direction of educational development. Rapid and wide-ranging curriculum shifts in Indonesia are often influenced by broader political dynamics, as education frequently becomes a tool for political legitimacy for new administrations or ministers (Alawi, 2018). Moreover, limited digital competence among teachers and disparities in infrastructure across regions remain significant obstacles to achieving equitable education quality. These conditions demonstrate that Indonesia's commitment to Sustainable Development Goal 4 (Quality Education) still encounters substantial challenges, particularly in ensuring equal access, consistent quality, and relevance to contemporary needs. Digital transformation in education is not solely about social justice but is also closely linked to environmental governance. When students across the region gain equitable access to quality digital learning, they develop the critical thinking skills, information literacy, and collaborative competencies necessary to address complex environmental challenges, such as climate change, biodiversity loss, and unsustainable resource exploitation. Voogt & Roblin (2012) argue that 21st-century competency frameworks must integrate environmental awareness as a foundational literacy. The Finnish National Core Curriculum (Finnish National Board of Education, 2016) embeds sustainability as a cross-cutting theme across all learning areas, demonstrating that educational governance and environmental governance can be purposefully aligned. For Indonesia, this intersection represents a significant policy opportunity: a stable and inclusive digital education system can simultaneously advance SDG 4 (Quality Education), SDG 13 (Addressing Climate Change), and SDG 10 (Reduced Inequalities), making digital education governance a key pillar of a long-term environmental sustainability strategy (Holmberg & Samuelsson, 2006). Given these challenges and the differences in educational policies between Scandinavian countries and Indonesia, this study formulates two main research questions: First, how does the consistency of educational policies in Scandinavian countries, particularly Finland, support the success of digital transformation, while Indonesia's frequently changing policies hinder the effectiveness of educational digitalization? Second, how can Indonesia learn from the Nordic educational policy model to develop a sustainable digital education system that remains rooted in local and national values?

2. Methods

This study employs a descriptive qualitative approach using the library research method. This approach is selected because the focus of the study lies in analyzing Finland's educational policies as a representation of the Nordic education system, and comparing them with Indonesian educational policies to formulate a sustainable model for digital education reform. This research adopts a normative-comparative character, which involves examining norms, principles, and policy frameworks contained in official documents such as the National Education System Law, presidential regulations related to digital transformation, the Finnish National Core Curriculum, as well as international reports such as PISA and the Sustainable Development Goals (SDGs). In addition, the study draws from scholarly literature, academic journals, books, and previous research to strengthen the conceptual analysis.

Data collection is conducted through documentation and literature review techniques, which involve gathering, reading, and examining policy documents, academic journals, and research reports relevant to digital transformation in education. The collected data are analyzed using content analysis to interpret the substance of educational policies and

conceptual ideas, and comparative analysis to compare the effectiveness, consistency, and underlying values of the educational systems in Finland and Indonesia. The analysis process includes data reduction, thematic categorization, interpretation, and conclusion drawing to construct a model of digital education policy that is adaptive, sustainable, and rooted in local values, as illustrated in the Grand Design for the Reformulation of the National Digital Education Policy and the INDEC model developed in this study.

3. Results and Discussion

3.1 Consistency of Scandinavian education policy in supporting digital transformation: Lessons for Indonesia

Digital transformation in education is a fundamental process that not only includes the use of technological devices, digital applications, or infrastructure modernization, but is also related to changing learning paradigms, adjusting educational mindsets, and policy reforms that support the sustainability of the national education system. In the context of developing countries such as Indonesia, education digitalization is often understood narrowly as the provision of technology facilities or the procurement of digital-based learning tools. In fact, the success of digital transformation is highly dependent on consistency, sustainability, and stable policy direction in the long term. Without a strong policy foundation, digitalization is only a short-term project that does not have a significant impact on improving the quality of learning. Indonesia faces a major challenge in the form of instability in education policy that often changes along with the change of ministers or the political direction of the government. Policy patterns that are reactive and often do not go through in-depth evaluation make the world of education in an uncertain situation, where teachers, schools, and local governments must constantly adjust to new policies that are not necessarily relevant to the needs and conditions of the field. This inconsistency not only hinders learning innovation, but also has the potential to create new inequalities between regions, especially when digitalization is implemented top-down without considering regional readiness. Digitalization, which should be a means of equity, can actually widen the gap in the quality of education.

One clear example of such policy instability can be seen from curriculum changes in the last two decades. Since the enactment of the 2004 Curriculum (KBK), Indonesia has changed the curriculum several times, starting from the 2006 Education Unit Level Curriculum, the 2013 Curriculum, the revised 2013 Curriculum, to the Independent Curriculum since 2022, without a thorough evaluation of the previous implementation. Teachers often only receive short training without adequate assistance, so curriculum changes actually cause confusion, excessive administrative burden, and uncertainty in the direction of learning. This condition is inversely proportional to Scandinavian countries such as Finland, Norway, and Sweden which are known to have stable, visionary, and sustainable education policies. Finland, as one of the best examples, has a National Core Curriculum that is systematically updated every 10 years through a long process that is research-based, participatory, and free from the influence of ministerial changes (Saari & Sääntti, 2018a). The curriculum not only serves as an academic guide but also becomes an ideological framework that directs the long-term goals of national education. The update that is carried out only once a decade provides space for schools, teachers, and local governments to evaluate, adapt, and develop learning innovations without being disrupted by the sudden emergence of new policies. Figure 2 visualizes the stark contrast in curriculum revision frequency between Indonesia and Finland, providing empirical grounding for the policy instability argument above.

Meanwhile, Kupiainen (2022) emphasized that gradual and research-based curriculum changes have made the transformation of education in Finland more profound and not just a change of policy documents (Kupiainen, 2022). In Indonesia, there is actually a legal basis that regulates the importance of the sustainability of education policies. Law Number 20 of 2003 concerning the National Education System emphasizes that curriculum development

must be carried out in a sustainable manner to ensure the improvement of the quality of national education. In addition, Law Number 23 of 2014 concerning Regional Government provides flexibility for local governments to adjust education policies based on local needs without leaving the national direction (Saarinen et al., 2021). However, in practice, these provisions often do not run optimally due to the dominance of short-term political interests, the change of officials, and the lack of evidence-based evaluations carried out systematically.



Fig. 2. Curriculum Revision Frequency: Indonesia vs. Finland. Indonesia revised its national curriculum four times in 18 years (average interval ~6 years), compared to Finland's research-based ~10-year revision cycle insulated from short-term political change

To overcome these problems, Indonesia needs a more comprehensive, sustainable, and data-based reformulation of digital education policies. This reformulation is not only related to curriculum changes, but also includes education governance, evaluation mechanisms, teacher training systems, and the establishment of special institutions tasked with maintaining the sustainability of national education policies in the long term. Policy reformulation must be carried out cyclically, not linearly, so that each policy formulated can be evaluated, analyzed, and revised based on empirical data. This idea is described in the Grand Design of the National Digital Education Policy Reformulation Based on Continuous Evaluation. This grand design shows that the digital education policy process must be cyclical and adaptive, consisting of five main interrelated stages. Figure 3 visualizes the Reformulation of the National Digital Education Policy Based on Continuous Evaluation.

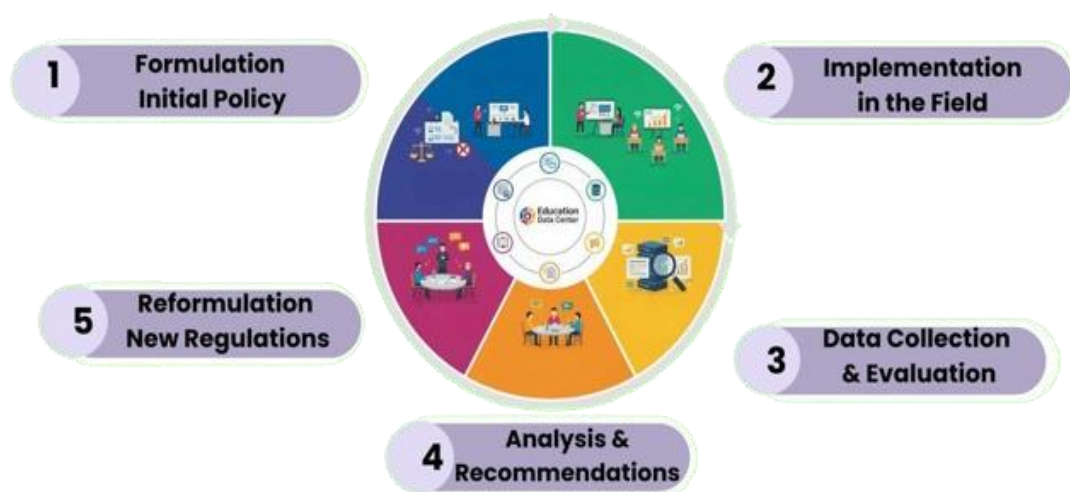


Fig. 3. Grand design of national digital education policy reformulation based on continuous evaluation

The first stage is the formulation of initial policies through the preparation of a visionary, inclusive, and long-term oriented national digital education roadmap. This roadmap serves as a strategic framework to direct all education digitalization programs in Indonesia. The most relevant example can be seen from Finland which has a vision of curriculum renewal every 10 years. Indonesia's digital education roadmap should ideally be valid for at least 15 years so that the policy direction remains stable and the regions have certainty in developing learning. The roadmap must include digital transformation based on the quality of learning, teacher capacity building in digital pedagogy, equitable distribution of infrastructure and internet access, strengthening students' digital literacy, student data protection, digital security, as well as multi-stakeholder collaboration strategies between the central government, regions, schools, communities, and the private sector. With a long-term roadmap, the change of ministers will not drastically change the direction of policy, but rather strengthen the existing foundations.

The second stage is field implementation that must consider the social, cultural, geographical, and economic diversity between regions. The digitalization of education cannot be applied uniformly in an archipelagic country like Indonesia (de Sousa, 2022). Therefore, the involvement of teachers, students, the community, and local governments is very important so that the implementation of policies is truly in accordance with the needs of the field. This stage includes mapping regional readiness related to infrastructure, human resources, and learning culture; teacher training on an ongoing basis; school transformation assistance; feedback mechanism from schools to the central government; as well as proportional budget support based on regional needs. This participatory implementation model has proven effective in Finland which places teachers as the main actors of education reform.

The third stage is data collection and evaluation by the national Education Data Center which functions to monitor the readiness of digital infrastructure in schools, the level of teachers' digital competence, student learning outcomes, the impact of digital curriculum implementation, and various challenges faced by the regions (Goman, 2026). With this data, governments can identify the digital divide and develop more targeted policy interventions. Such a model is implemented by the National Agency for Education (EDUFI) in Finland which routinely monitors the implementation of the national curriculum.

The fourth stage is the analysis and preparation of recommendations by an independent national education council that is free from political intervention and consists of educational experts, academics, researchers, and experienced practitioners. This council is tasked with analyzing data from field evaluations, providing research-based recommendations, maintaining policy sustainability, and supervising the direction of digital transformation to remain adaptive and equitable. This concept mimics the function of the Finnish Education Evaluation Centre (FINEEC) which evaluates the Finnish education system as a whole.

The fifth stage is the reformulation of new regulations based on recommendations and evaluation results. One of the important proposals is the addition of a paragraph to Article 36 of Law Number 20 of 2003 which states that the national education curriculum cannot be changed within a minimum period of 15 years from its enactment, unless the results of the national academic evaluation show an urgent need to update the substance of the curriculum. This regulation will provide certainty in the direction of learning for teachers, protect education from short-term political interests, and provide room for innovation in the application of digital technology.

The success of digital transformation is not only determined by the technology used, but also by policy consistency, governance quality, and the ability of the education system to adapt. Implementation of these regulations encourages organizations to establish clear internal policies, conduct regular data audits, and provide compliance training for employees, particularly those directly involved in managing HR data (Pettalogi et al., 2025). Indonesia can emulate Finland in implementing research-based policies, maintaining curriculum stability in the long term, and involving teachers as the main actors in education reform.

However, the Finnish approach cannot be applied raw because Indonesia has different demographic conditions, cultures, government systems, and regional capacities. Digital transformation in Indonesia must consider the plurality of society, technology access gaps, variations in the quality of human resources, and specific local needs. With stable, visionary, and continuous evaluation-based policies, the digital transformation of education in Indonesia can run more effectively and equitably. Technological modernization will be more meaningful if it is accompanied by improving the quality of learning for all students without exception. Through the restructuring of curriculum policies and the digitization of education based on long-term evaluation, Indonesia can strengthen its position in realizing quality, equitable, adaptive, and aligned education with the Sustainable Development Goals (SDG 4) goals on Quality Education.

The consistency of education policies in Scandinavian countries has become one of the key factors that has enabled digital transformation in the education sector to take place in a stable, directed and sustainable manner. In this region, digital transformation is not only considered a technological adjustment, but a long-term vision that is integrated with national strategies, human development, and social equity. This kind of approach opens up opportunities for Indonesia to learn how a country can integrate digitalization with the values of education democracy, equal access, and consistent policy planning from generation to generation.

One of the important characteristics of Scandinavian education policy is its orientation to equality (Sumantik, 2024). The principle that every student deserves the same learning opportunities is the basis of their entire digital policy. Digital transformation in schools is not intended to create new gaps, but rather to be a mechanism to eliminate old barriers such as limited learning resources, uneven quality of teachers, and differences in facilities between regions. By viewing technology as a tool to strengthen the democratization of education, countries such as Finland, Norway, and Sweden ensure that digitalization not only accelerates the learning process, but also expands access.

In addition, the consistency of Scandinavian policies is reflected in the clarity of the regulatory framework. All countries in the region have national digital strategies designed with clear targets and a long implementation timeframe, usually 10–15 years. Any policy changes that arise are not a reaction to political change, but based on research, external evaluation, and consultation with various stakeholders (Oktavianatun & Nugraheni, 2024). This is what allows schools in Scandinavia to adopt technology without feeling rushed or confused due to frequent policy changes. The stability of this kind of policy provides certainty for teachers, principals, curriculum makers, the digital industry, and the academic community to formulate their own strategic steps.

Judging from the composition of its implementation, the success of digital transformation in Scandinavia is greatly influenced by a coordinated decentralization approach. The central government provides direction, standards, and infrastructure support, but technical implementation is left to local governments and schools. This allows for contextual innovation without ignoring national standards. This kind of model creates healthy flexibility: schools are free to choose digital platforms, technology-based learning methods, or forms of digital assessment that best suit the needs of their students. Meanwhile, the government continues to monitor to ensure that the quality of education does not decline and remains equal between regions.

The Scandinavian approach to digital transformation also pays attention to the preparation of educators. Teachers are not considered as objects of policy change, but rather as the main subjects that determine the success of transformation (Riswanto & Mulyanti, 2024). Teacher training is carried out regularly and in a structured manner. Every technological change in schools is always followed by in-depth training, mentoring, and digital competency certification. The government is not only focusing on teachers' technical abilities, but also digital pedagogical skills, how to integrate technology into the curriculum, how to use learning data to map student needs, and how to maintain digital ethics in the

classroom. This approach is in stark contrast to the habits of many countries, including Indonesia, which often introduce new technologies without adequately preparing teachers.

In addition to strengthening human resources, Scandinavian countries ensure that their digital transformation has a solid infrastructure foundation. High-speed internet is considered a mandatory public service available in all regions, even remote areas. This equitable distribution of infrastructure makes digitalization run fairly, without any schools being left behind due to limited internet access. The government is actively investing in national data centers, educational cybersecurity systems, as well as cloud storage facilities used by schools, teachers, and students. This infrastructure approach shows that for Scandinavia, digitalization does not stop at devices but includes long-term support systems. In contrast to Finland's sustained infrastructure investment, the following figure illustrates Indonesia's school-level digital infrastructure gap and its regression after the pandemic-era policy push, based on official Central Statistics Agency/*Badan Pusat Statistik (BPS)* data.

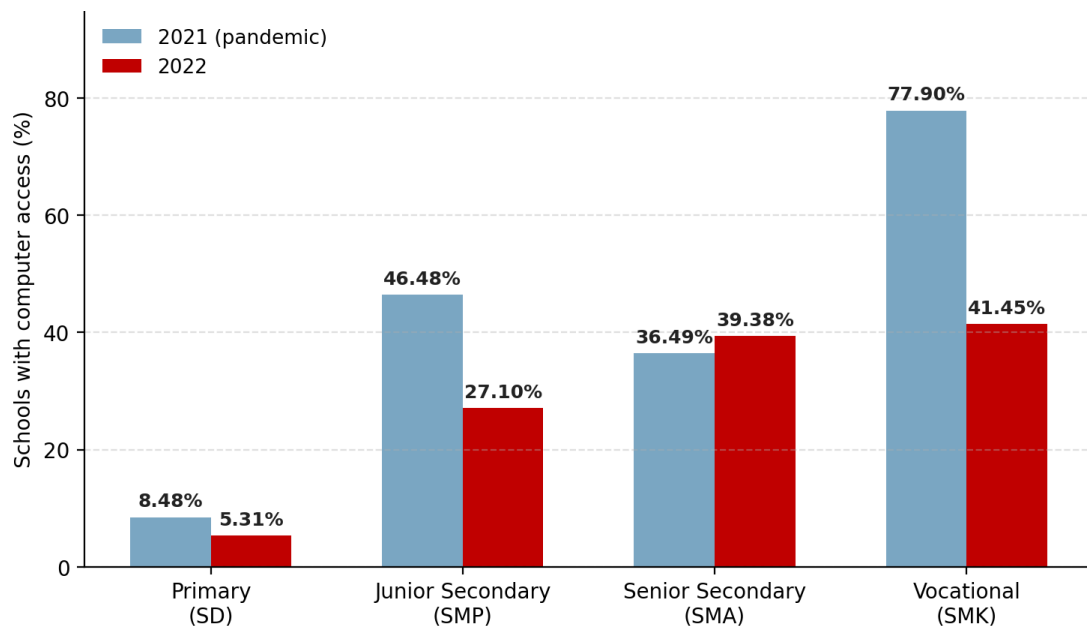


Fig. 4. School Computer Access by Education Level, Indonesia 2021–2022. The proportion of schools with computer access declined at the Primary (8.48%→5.31%), Junior Secondary (46.48%→27.10%), and Vocational (77.90%→41.45%) levels after the pandemic-era digitalization push ended, demonstrating how short-term, non-institutionalized policy interventions erode without sustained governance commitment.

In addition, Scandinavian education policies pay close attention to digital ethics and data security. Rapid digital transformation is not allowed to undermine student privacy or open up opportunities for ethical violations. Finland, for example, has very strict data protection laws that govern how student data may be collected, processed, stored, and shared (Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the Protection of Natural Persons with Regard to the Processing of Personal Data and on the Free Movement of Such Data, and Repealing Directive 95/46/EC (General Data Protection Regulation) (Text with EEA Relevance), 2016). The principles of data minimization and data responsibility are applied in all digital education platforms. This kind of policy ensures that digitalization is not only efficient, but also safe and in accordance with democratic values.

One of the big lessons that Indonesia can learn is the importance of policy synchronization between the central and regional governments. Policy consistency in Scandinavia can be maintained because communication between levels of government takes place intensely and transparently. The central government sets the strategic direction, while the local government becomes an active partner in implementation. No region takes different

steps without coordination, so that there is no policy inequality or confusion in implementation. For Indonesia, which has a broader and more complex governance structure, strengthening coordination is a must if we want to build a stable and consistent digital transformation.

In addition, Scandinavian countries have a strong tradition of public participation in policymaking. Digital transformation is not a unilateral decision by the government, but the result of long discussions between academics, teachers, community organizations, the technology industry, and students. By involving the wider community, digital policies become more realistic, more in line with needs, and easier to accept. This participatory model is very relevant for Indonesia, especially considering the diversity of regions, cultures, and educational needs.

In the context of implementation in schools, Scandinavia provides a large space for local innovation. Teachers are encouraged to create their own digital teaching materials, utilize applications that meet students' needs, and conduct methodological experiments. Meanwhile, the digital assessment system encourages students to develop critical thinking, collaboration, creativity, and digital literacy skills. By making schools the center of innovation, digital transformation is not only a technology project, but also a pedagogical evolution that has a real impact on the quality of learning.

Indonesia can take important lessons from this success. Digital transformation will not succeed if it is only focused on procuring devices and platforms. The key to success lies in policy sustainability, teacher readiness, equal access, and the government's seriousness in ensuring that digitalization runs as a long-term strategy, not a temporary program. By imitating the consistency of Scandinavian policies, Indonesia can build an education system that is not only modern, but also adaptive, inclusive, and sustainable.

Table 1. Comparative policy matrix: Finland vs. Indonesia in digital education governance

Policy Dimension	Finland	Indonesia
Curriculum Stability	Updated approximately every 10 years; research-based and participatory; insulated from short-term political interference	Multiple revisions within a decade (KBK 2004, KTSP 2006, K13, Merdeka 2022); frequently influenced by ministerial transitions
Digital Infrastructure	Universal high-speed internet; equitable coverage across all regions including rural areas	Internet penetration at 82.05% (BPS, 2024) but distribution remains uneven; significant disparities in remote areas
Teacher Readiness	Master's degree mandatory at all levels; structured digital pedagogy training; teachers as autonomous innovators	Qualifications vary; digital competency training often inadequate or inconsistent; teachers positioned as curriculum implementers
Governance Model	Coordinated decentralization; municipalities and schools hold significant autonomy; FINEEC as independent evaluator	Centralized with ongoing decentralization; limited independent evaluation capacity; INDEC proposed to strengthen coordination
Environmental Literacy	Explicitly embedded in the National Core Curriculum; sustainability as a cross-curricular competency	Systematic integration limited; environmental education exists but not yet consistently linked to digital policy or SDG frameworks
Data Protection	Data protection laws aligned with GDPR; data minimization applied across all educational platforms	Personal Data Protection Law enacted (2022); implementation in the education sector remains under development
SDG Alignment	Strong alignment with SDG 4, SDG 10, SDG 13; sustainability embedded in educational vision and practice	SDG 4 commitment stated in national policy; alignment with SDG 13 and environmental dimensions requires strengthening

On the other hand, Indonesia needs to consider its geographical and social diversity. The Scandinavian model cannot be replicated just like that, but it must be adapted. Infrastructure challenges, digital literacy gaps, and differences in school capacity in Indonesia require a gradual strategy. However, core Scandinavian values such as policy certainty, equal access, teacher readiness, and data protection remain relevant in the Indonesian context.

Long-term policy consistency should be the main foundation. The Indonesian government needs to avoid too frequent curriculum changes, reactive regulatory adjustments, and unsustainable digitalization programs. Instead, Indonesia needs to formulate a digital roadmap for education until 2045, with clear targets and not dependent on a change of government. In this way, the world of education can move in a stable and measurable direction. Furthermore, Indonesia needs to strengthen the collaborative ecosystem between the government, academics, industry players, and the community. Digital transformation is not only the task of the government, but also the collaboration of many parties. By building national synergy similar to the Scandinavian model, Indonesia can accelerate transformation while ensuring equitable distribution of results. Last but not least, Indonesia needs to place teachers as the center of change. The investment in teachers' digital competencies must be greater than the investment in hardware. When teachers feel confident and skilled, technology will become a tool that completely changes the learning process. Otherwise, digitization only stops at the surface view. Ultimately, the Scandinavian case study shows that a successful digital transformation of education is not because the technology is the most sophisticated, but because the policies are the most consistent (Saari & Sääntti, 2018b). This consistency was born from a long-term vision, a commitment to equity, and an awareness that education is a cross-generational investment. These lessons can be an inspiration for Indonesia to build a resilient and equitable digital education.

3.2 Indonesia's adaptation strategy towards sustainable and local value-based digital education

Education is the main foundation in developing quality human resources capable of competing globally. In fact, the right to education has been recognized as a fundamental element of human rights globally for many years, especially since the adoption of the Universal Declaration of Human Rights (UDHR), which establishes the foundation for the concept that education, as part of human rights, should be provided free of charge, especially at the primary level, and that education should be equally accessible to every individual based on their quality/achievement (Aulia, 2018). The education system plays a strategic role in shaping the quality of future generations and producing a society that is intelligent, innovative, and has integrity (Yustiani et al., 2024). In Indonesia, the education system refers to the National Education Standards (SNP) guidelines and is strengthened through internal (SPMI) and external (SPME) evaluation tools, managed by institutions such as BAN-S/M and BAN-PT (Nugraha et al., 2025). However, many countries, including Indonesia, face challenges such as disparities in the quality and access to education, reliance on standardized tests, and a lack of learning innovation.

John Dewey, a pioneer in progressive education, emphasized the importance of education that focuses on student needs and relates directly to real life. Education aims not only to teach knowledge but also to develop critical thinking, collaboration, and innovation skills (Subairi, 2024). The digital era has fundamentally revolutionized education, with information and communication technology becoming a key driver for broader and more democratic access to education. The Golden Indonesia 2045 vision positions quality education as a strategic foundation for developing superior and globally competitive human resources. With the efficient use of digital technology, education can become more integrated and meet future standards and needs (Matos et al., 2025). This situation is increasingly significant as geographic and cultural boundaries begin to fade, while the flow of information and technological advancements move at an unprecedented pace.

As is known and written in Law Number 39 of 1999 concerning Human Rights, it not only discusses general rights such as the right to life and the right to be free from slavery, but also emphasizes the right to education, the right to develop oneself, and to improve the quality of individuals so that they become faithful, pious, and happy people, and do not escape the effort to have a bright future (Tambun et al., 2020; Komisi Nasional Hak Asasi Manusia, 2020). Legally, the targets of education in Indonesia are regulated in Law No. 20 of 2003 which emphasizes the development of citizens who are just and respect diversity, and in accordance with Article 28C paragraph (1) of the 1945 Constitution which guarantees the right of every person to develop themselves through education, science, technology, art, and culture in order to improve the quality of life and welfare of humanity (Yustiani et al., 2024).

According to information from the Central Statistics Agency/*Badan Pusat Statistik* (BPS) in 2021, Indonesia's population aged 0 to 19 reached approximately 88.3 million. This age group is expected to become Indonesia's Golden Generation of 2045, qualified and capable of competing globally (Astrid, 2022). In line with the first foundation for achieving Indonesia's 2045 vision, to realize this generation, Indonesia must build a digital education system that is not only technologically modern but also rooted in local and humanitarian values. From a theoretical perspective, the success of digital transformation in education depends on several factors, including technology acceptance by educators and students, policy support, and institutional capacity. The Technology Acceptance Model (TAM) suggests that perceptions of ease of use and the benefits of technology are key factors in technology acceptance.

Meanwhile, capacity building theory emphasizes that technology adoption needs to be supported by ongoing training, mentoring, and adequate resources. Without these elements, digital transformation will remain merely an idea without a significant impact on learning quality. In the context of national policy, Regulation of the Director General of Teachers and Education Personnel Number 7607/B.B1/HK.03/2023 is a strategic foundation for integrating technology into the performance management of educators and principals. This policy covers technology-based planning, implementation, and performance evaluation, with the aim of creating a more transparent, accountable, and responsive system to national education needs. However, the implementation of this policy faces various challenges, such as a lack of understanding of technology among stakeholders and limited infrastructure in many educational institutions. There is a gap between policy formulation and implementation on the ground. Previous studies have focused primarily on technical aspects, such as technology accessibility, without conducting an in-depth evaluation of the policy's impact on learning quality. Furthermore, there has been no comprehensive study that incorporates the perspectives of educators, principals, and other stakeholders in analyzing policy effectiveness (Nashrullah et al., 2025).

Meanwhile, Finland's education system, through its 2015 strategy, highlights the principles of equality, trust, and freedom to innovate for students, while avoiding excessive competition (Yustiani et al., 2024). This is where Indonesia can learn from the Scandinavian education model, particularly Finland, which successfully combines digitalization with humanistic values such as equality, trust, and teacher well-being. According to the Global Human Development Index, children in these countries begin their education at the age of 6-7. The average duration of schooling in Finland is 10-29 years (Kjølberg, 2022). Finland has implemented a decentralized education system since the late 1980s, granting municipalities and schools significant autonomy in selecting and managing digital solutions to support efficient teaching and management. This system makes schools responsible for self-management and curriculum development in accordance with National Education Council guidelines, with teachers free to choose teaching methods that enhance their skills and professional status. This contrasts with Indonesia, which tends to implement centrally standardized policies and curricula, limiting teachers' creativity and freedom, leaving them more as implementers than innovators. In a decentralized system like Finland, schools are not only given trust, but are also encouraged to adapt to the needs of local values and the

character of their students, so that the teaching and learning process becomes more relevant and effective.

Finland is transforming its education system to make it more adaptable and accessible to students. When the OECD (Organization for Economic Co-operation and Development) conducted the Program for International Student Assessment (PISA) in 2015, Finland emerged as a high-performing country, offering top-tier education in reading, science, and mathematics. Its results, however, ranked among the lowest in terms of education quality, in contrast to Indonesia. Finland adopted Ki Hadjar Dewantara's approach to providing high-quality education throughout the country (Haryanto & Iqbal 2024). In recent years, the Indonesian government has strived to improve education quality through various policies, such as competency-based curricula and the use of technology. However, a gap remains between expectations and the reality of education, with learning approaches in Indonesia often focused on teachers, focused on exams, and limited in terms of student creativity and participation. Finland is renowned for its high-quality education system. The country has a population of around 5 million. In contrast, Indonesia has a much larger population of over 220 million people, and is diverse in terms of ethnicity, religion, culture, and social status, with a 75-year history of formal education. Education observers from the US, UK, France, and Japan have revealed that, despite the US allocating a significantly larger education budget than Finland, its students rank only 17th and 24th in the PISA test. Meanwhile, China ranks first, Finland second, and South Korea third. The Finnish education system offers a more adaptive, student-centered paradigm that emphasizes the entire learning process. Project-based learning and group discussions are heavily emphasized to support students in developing critical thinking, collaboration, and innovation skills. This approach emphasizes in-depth understanding of the material rather than mere memorization and prioritizes ongoing evaluation processes that are more responsive to student development (Yustiani et al., 2024). There are several fundamental factors that explain how the Finnish education system has succeeded in building a reputation as one of the best in the world, namely as follows.

First, learning models and curriculum design, the Finnish education system emphasizes a more holistic curriculum approach, focusing not only on mastery of subject matter but also on developing 21st-century skills such as critical thinking, innovation, communication, and collaboration (Ratnawati et al., 2024). Finland places greater emphasis on equitable access to education and adopts continuous assessment rather than exam-based assessments. In contrast, Indonesia is generally governed by a strict national curriculum, with significant emphasis on academic achievement and mastery of material. The learning process follows a top-down approach, where teachers act as primary educators and students tend to passively receive information. Exams are used as the primary measure of learning success, indicating a reliance on outcome-based assessment. Although the Indonesian system has integrated similar principles through "*Merdeka Belajar*," implementation on the ground still focuses on the assessment system and limited facilities (Yustiani et al., 2024).

Second, professional competencies of educators and their teaching strategies, the quality of teachers plays a crucial role in determining the quality of education. Finland implements rigorous teacher selection procedures and provides comprehensive training programs, resulting in a highly qualified workforce (Ratnawati et al., 2024). In Finland, teachers are required to have a master's degree even at the elementary level, further ensuring the quality of education. The selection process for teacher training institutions in Finland is rigorous, admitting only candidates with high intelligence and adequate psychological skills. Finland adopts a more dynamic and experiential approach, such as project-based learning, where students are encouraged to actively engage and explore topics that interest them. Educators in Finland act as facilitators, guiding students through the exploration and problem-solving process, creating an inclusive and collaborative learning environment.

Furthermore, educators have complete freedom to design school curricula and adopt teaching methods tailored to students' needs, as well as the freedom to use technology in the

learning process. This freedom allows educators to innovate significantly, create flexible strategies to meet students' needs, and build a more responsive and creative learning environment. Furthermore, they have the flexibility to choose the most effective methods to support the learning experience, create a satisfying work atmosphere, and enhance the profession's reputation. In fact, the teaching profession in Finland is considered more prestigious than medicine or law (Yustiani et al., 2024).

Then, student involvement, Finland emphasizes active student participation as a crucial element of education. In Finland, students are encouraged to participate in class discussions, express their views, and contribute to the planning of the learning process. Through this involvement, students not only feel responsible for their own educational development but also achieve deeper and more meaningful learning outcomes. Students can even set personal learning goals, which they share with their parents, fostering family involvement in the educational process. Thanks to school reforms, Finland has built a solid academic reputation, including through comprehensive in-school guidance and counseling services (Yustiani et al., 2024). These counseling programs are designed to assist secondary-level students in choosing the right educational path, whether continuing on to upper secondary or vocational education, thus easing their transition to the workforce. These guidance programs have significantly contributed to student graduation rates in Finland, facilitating strong connections between education and the professional world.

Furthermore, utilization of technology and availability of supporting facilities, Finland is known as a country that maximally implements educational technology, placing technology as a core element in the learning process. From an early age, students are accustomed to interacting with digital devices, which are then used as supporting media to enrich their learning experiences, both independently and through collaborative activities. Furthermore, Finland has a comprehensive policy framework to ensure inclusive education and student well-being, from early childhood through elementary school (Yustiani et al., 2024).

Therefore, with the rapid adoption of digitalization in the education sector, the need to monitor and evaluate its impact is crucial. Indonesia, with its geographical and social diversity, requires a measured and contextual approach to ensure that digitalization truly provides maximum benefits for each region. Therefore, the establishment of INDEC (Indonesia Education Center) focuses on measuring and analyzing the impact of digitalization in various regions. To illustrate the link between policy formulation, field implementation, and evaluation conducted by INDEC, the following program flowchart represents the cross-governmental working mechanism in the national digital education transformation based on local values and regional cultural wisdom.

The illustration in Figure 5 depicts the flow of a national digital education system based on local values and collaboration between levels of government. This diagram shows three main stages in the national digital education policy cycle. The first stage, "Initial Policy Formulation", describes the role of the central government in designing a digital education roadmap through national policies such as Presidential Decree Number 188 of 2024 and the National Education System Law, which form the basis for educational decentralization and encourage inclusive and adaptive transformation. After the curriculum is finalized, the regional government continues to formulate additional policies tailored to local values and the specific needs of each region, as stipulated in Law Number 22 of 1999 concerning Regional Government, which was later revised to Law Number 32 of 2004 concerning Regional Government, and most recently to Law Number 23 of 2014 concerning Regional Government, reflecting the recognition of the existence of autonomous regions and the transfer of authority, rights, and responsibilities to manage government affairs in certain areas from the Government to the Regions. This also includes various management and development options for the education sector, where there is a shift in education management from a centralized to a more decentralized one. The implementation of this educational autonomy is emphasized in Law Number 20 of 2003 concerning the National Education System, which emphasizes a change in the national education paradigm, from

education for all to education of all, by all, and for all. This approach aligns with Indonesia's national education system reform initiative, which draws inspiration from the Nordic education policy model to support digital transformation based on the Sustainable Development Goals (SDGs). In this context, the establishment of the Indonesia Education Center is crucial as an institution to evaluate and monitor the impact of digitalization in each region, ensuring more appropriate policies and responsiveness to local situations.



Fig. 5. Flowchart of national digital education transformation system based on local values and cross-government collaboration (INDEC Model).

Second stage, “Regional Data Implementation and Analysis”, is a crucial element in curriculum development because it is the concrete manifestation of the designed curriculum. The success of curriculum implementation is greatly influenced by the strategy implemented, which includes managing certain factors, such as resource readiness, infrastructure, learning methods, community aspects, and others. Several fundamental principles serve as the foundation for ensuring the curriculum meets the expectations of the institution, students, parents, and the community. Therefore, it is crucial to determine core principles that support and serve as the fundamental foundation for curriculum design. These principles include relevance, effectiveness, efficiency, continuity, flexibility, goal-orientedness, and the principle of synchronization. Implementation is carried out to understand the ongoing needs in each region. Students are allowed to actively interact in each lesson so that weaknesses and deficiencies can be clearly identified. This is crucial because only by directly understanding the challenges in the field can teachers and education administrators make appropriate adjustments. Furthermore, active student participation also encourages them to be more critical and independent in their learning, which is the primary goal of digital education transformation. The collected data is not just numbers, but a true reflection of the learning conditions in the region. Based on this, regional and central governments can jointly formulate relevant strategic steps that can improve the quality of education sustainably in accordance with local needs and the national vision.

Third stage, “Reformulation and Evaluation”, is the core of INDEC's (Indonesia Education Center) role as a bridge between national policy and regional implementation. INDEC (Indonesia Education Center) processes data, analyzes local needs, and reformulates digital education regulations to be more adaptive to regional values and the characteristics of local communities. This approach is rooted in the Nordic education policy model, which emphasizes equality, the involvement of all stakeholders, and flexibility that allows for adaptation to the characteristics and needs of each region. The Center serves not only as an institution measuring the impact of digitalization but also as a facilitator in developing

inclusive and responsive data-driven policies. Through active collaboration between the central government, regional governments, teachers, and academics, the Indonesia Education Center will oversee the implementation and effectiveness of education digitalization policies. This includes ensuring that digitalization does not eliminate local values but instead strengthens the identity and characteristics of regional education.

The bridge in the illustration is a symbol of collaboration between the central and regional governments, which are connected by roots with the words “Local Values & Cultural Wisdom: Mutual Cooperation, Deliberation, and Regional Context” as the moral and cultural foundation of the entire policy process. Overall, this illustration emphasizes that the transformation of digital education in Indonesia is not solely oriented toward technological advancement, but also grounded in local values, mutual cooperation, and collaboration among all stakeholders to realize an equitable, contextual, and sustainable education system. As a supervisory and evaluation body for curriculum implementation, this center plays a role in actualizing the development of digital education in the region without neglecting local values, while still using regional policies as the primary reference (Sârb, 2024). Furthermore, this center also serves as a data source for the development of teaching staff to offer more comprehensive and monitored digital access. The existence of this institution is a step in the implementation of a decentralized system that prioritizes the principles of equality and justice. The involvement of teachers, academics, and the community in this process will make curriculum implementation more representative, as they are direct actors in the field who deeply understand the characteristics and needs of students. In the implementation of educational decentralization, regional governments, as the entities with the highest authority in their regions, have the authority to regulate, manage, foster, and supervise. Therefore, regional government commitment to the implementation of educational decentralization is crucial. It is hoped that regional governments can create strategies and innovations in implementing educational decentralization in their respective regions. Regional governments understand and know what must be done to improve the quality of education in their regions.

A critical dimension that must be integrated into Indonesia's digital education governance framework is its link to environmental sustainability. Equitable digital education is not only a mechanism for social justice but also a fundamental pathway for building environmental citizenship and ecological resilience. When students across Indonesia have equitable access to quality digital education, they develop the critical thinking, information literacy, and collaborative skills necessary to meaningfully engage with environmental challenges such as climate change, deforestation, and marine ecosystem degradation. Finland's national curriculum explicitly embeds sustainability competencies, requiring students to understand the interdependence between human society and natural systems (Finnish National Board of Education, 2016). This integration of sustainability literacy into digital education governance is a model that Indonesia should actively adopt. Furthermore, the digital infrastructure investments proposed in the Grand Design must be accompanied by green technology principles. Sustainable digital infrastructure, including energy-efficient data centers, e-waste reduction policies, and low-carbon connectivity solutions, ensures that the expansion of digital education does not exacerbate environmental burdens (Holmberg & Samuelsson, 2006). INDEC (Indonesia Education Center), as the national evaluation center, should incorporate environmental impact assessments into its digitalization monitoring framework, tracking not only learning outcomes and equity indicators, but also the ecological footprint of digital education expansion. This approach would align Indonesia's digital education governance with SDG 4 (Quality Education), SDG 13 (Addressing Climate Change), and SDG 17 (Partnerships for the Goals), creating a truly integrated sustainability governance framework (UNESCO, 2021; Voogt & Roblin, 2012).

Within this framework, digital transformation in education should not be treated as a stand-alone sectoral reform, but rather as one instrument in a broader sustainability governance architecture, where education, technology, and environmental policies shape

each other, rather than being managed in isolation. Political decision-making in education carries long-term environmental consequences that are rarely made explicit in policy debates. When curriculum and digitalization policies are frequently revised following short electoral cycles or ministerial changes, as has repeatedly occurred in Indonesia (KBK 2004, KTSP 2006, Kurikulum 2013, Merdeka 2022), the resulting institutional discontinuities undermine the long-term planning required by sustainability transitions: infrastructure investments become neglected or overlap, environmental literacy components introduced in one curriculum cycle are removed in the next, and accountability for the ecological footprint of digital expansion becomes fragmented among successive governments, rather than tracked sustainably. The Finnish experience suggests the opposite causal pathway: by protecting curriculum reforms from short-term political shifts and embedding sustainability as a permanent, cross-curricular commitment (Finnish National Board of Education, 2016), Finnish policymakers were able to maintain consistent environmental literacy gains and green infrastructure investments across electoral cycles. This comparison suggests a more general governance proposition: the durability of political commitment in education policy is not only a determinant of pedagogical gains but also serves as a structural prerequisite for environmental governance gains, as environmental literacy, green digital infrastructure, and ecological citizenship can only accumulate if institutional memory and policy continuity are protected from short-term political volatility (UNESCO, 2021; Holmberg & Samuelsson, 2006). Therefore, the Grand Design and INDEC (Indonesia Education Center) proposed in this study are not intended solely as administrative coordination mechanisms, but rather as institutional safeguards designed to decouple environmentally consequential education policies from short-term political cycles, thus making policy stability itself an instrument of sustainability governance.

4. Conclusions

Digital transformation in education is a necessity in this era of globalization and rapid technological development. However, the success of digitization is not only determined by the availability of devices, infrastructure, or applications, but also by the quality of consistent, sustainable, and long-term policy management. Studies of Scandinavian countries, particularly Finland, show that policy consistency, clarity of direction, and commitment to values of equality and humanism are the main foundations for creating a stable, adaptive, and inclusive digital education ecosystem. A research-based, participatory approach, free from short-term political changes, has enabled these countries to build educational transformations that focus not only on technology but also on people as the center.

In contrast, Indonesia still faces various challenges that hinder the effectiveness of educational digitization. Frequent curriculum changes, reactive policies, and a lack of data-based evaluation have caused uncertainty in the world of education. Infrastructure inequality, low digital literacy among some educators, and limited access in certain areas further widen the gap in education quality. In fact, Indonesia has great potential with a large school-age population and a significant increase in internet usage. These challenges demonstrate the need for a digital transformation that focuses not only on technology but also on a comprehensive overhaul of education policy.

From Scandinavian practices, there are several principles that Indonesia can adopt. First, the importance of a long-term vision in the form of a national education digital roadmap that does not change with every change of minister or government. Second, the need to develop a sustainable and data-based evaluation mechanism through an independent institution—such as FINEEC in Finland that ensures every policy is implemented in accordance with the direction and needs of the field. Third, the importance of preparing teachers as key actors in the digitization process through in-depth training, continuous mentoring, and the granting of pedagogical autonomy. Fourth, the equitable distribution of infrastructure and digital access

must be a priority so that technology truly becomes a tool for equality, not a source of new inequality.

In addition, Indonesia must ensure that digital transformation continues to respect local values and geographical diversity. Equitable, inclusive, and high-quality digital education fosters the environmental literacy and ecological citizenship necessary for citizens to actively participate in the sustainability transition. By integrating environmental awareness into the digital curriculum and embedding green infrastructure principles in educational technology investments, Indonesia can simultaneously advance SDG 4 (Quality Education), SDG 13 (Addressing Climate Change), and SDG 10 (Reduced Inequality). This positions digital education governance not simply as a sectoral policy issue, but as a central pillar of Indonesia's long-term environmental governance and sustainable development strategy. Overall, learning from Scandinavia does not mean copying their systems in their entirety, but rather understanding the core principles behind their success: policy stability, teacher focus, equitable access, public participation, data protection, and the integration of sustainability values. The digitalization of education will be a key driver in realizing Indonesia's Golden Generation 2045, as long as it is based on visionary and consistent policies that prioritize the needs of all students in the country and the health of the planet they will inherit.

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Author Contribution

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The data used in this study comes from publicly available public documents (academic literature). No new data was created primarily for this study.

Conflicts of Interest

The authors declare no conflict of interest in this research.

Declaration of Generative AI Use

During the preparation of this work, the authors used Grammarly to assist in improving grammar, clarity, and the academic tone of the manuscript. After using this tool, the authors carefully reviewed and edited the content as needed and took full responsibility for the content of the publication.

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Biographies of Authors

Nur Jihan, Departement of Constitutional Law, Faculty of Sharia and Law, Universitas Islam Negeri Sunan Ampel Surabaya, Surabaya, East Java 60237, Indonesia.

- E-mail: nrjihan11@gmail.com
- ORCID: N/A
- Web of Science ResearcherID: N/A
- Scopus Author ID: N/A
- Homepage: N/A

Dinda Ayu Halimatus Sa'diyah, Departement of Constitutional Law, Faculty of Sharia and Law, Universitas Islam Negeri Sunan Ampel Surabaya, Surabaya, East Java 60237, Indonesia.

- E-mail: dindaayuhs@gmail.com
- ORCID: N/A
- Web of Science ResearcherID: N/A
- Scopus Author ID: N/A
- Homepage: N/A

Dhofarina Firda Kamala, Departement of Constitutional Law, Faculty of Sharia and Law, Universitas Islam Negeri Sunan Ampel Surabaya, Surabaya, East Java 60237, Indonesia.

- E-mail: dhonna.aulie@gmail.com
- ORCID: N/A
- Web of Science ResearcherID: N/A
- Scopus Author ID: N/A
- Homepage: N/A