Beyond Coding: Reframing Vocational Education Through South Korea's ICT Education Policy and the Varieties of Capitalism Framework

Seri Yoon, Waseda University, Japan

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Abstract

In 2018, South Korea implemented mandatory coding education in primary and lower secondary schools as part of a national education reform. While this policy is often celebrated as a forward-thinking strategy aligned with SDG 4.4, which aims to increase access to technical and vocational skills, it also reflects the country's unique industrial and economic structure, heavily shaped by export-driven conglomerates and a coordinated market economy model. Using a qualitative method, this study draws on policy documents, national curriculum guidelines, government reports, and economic development strategies to examine how South Korea's coding education policy reflects the structural characteristics of its coordinated market economy. Through document analysis interpreted within the Varieties of Capitalism framework, the research explores the institutional logic behind vocational education policy formation and its implications for the realization of SDG 4.4. By adopting Varieties of Capitalism (VoC) as a framework for analyzing education policy, this study contributes to a more structurally grounded understanding of skills development, strengthening the case for aligning educational reforms with broader socio-economic systems. It further contributes to global education discourse by questioning the uncritical adoption of high-tech vocational models and encouraging more context-specific strategies that reflect each state's economic and institutional configurations toward achieving the shared goal of SDG 4.4.

Keywords: Korean education policy, vocational education policy, ICT education, education and development, SDG 4.4

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Introduction

Over the past decade, South Korea has actively integrated Information and Communication Technology (ICT) into its national education reform. In 2018, the government implemented mandatory coding education in primary and lower secondary schools. This initiative was promoted as a forward-thinking strategy that prepares youth for a digital economy and supports the global commitment to Sustainable Development Goal (SDG) 4.4. SDG 4.4 aims to substantially increase the number of youth and adults with relevant technical and vocational skills for employment, decent work, and entrepreneurship by 2030 (United Nations, 2015). While coding education appears to support this goal, the policy also reflects deeper structural characteristics specific to South Korea's political economy.

South Korea's approach to vocational education policy has been shaped by its position as a coordinated market economy. This model emphasizes long-term collaboration between the state and industry, strong linkages between public and private actors, and a focus on export competitiveness (Hall & Soskice, 2001). Educational strategies are not developed in isolation. They are tied to broader industrial goals and institutionalized mechanisms of labor-market coordination. Chaebols are large conglomerates that dominate the Korean economy. They have historically shaped the types of skills the state promotes through its schooling system (Kim & Kim, 2021). These dynamics raise the question of whether coding education in Korea functions simply as a neutral tool for digital literacy or whether it also reproduces institutional logics embedded within the coordinated market model.

Existing research on ICT-based education in Asia often focuses on access, infrastructure, or innovation. However, fewer studies have interrogated how vocational education policy reflects and reproduces national economic structures. This gap becomes more salient as global education agendas increasingly endorse high-tech vocational programs without attending to structural differences among countries. As more governments pursue digital education policies under SDG 4.4, it becomes important to understand the political and economic context that shapes policy design and implementation.

This study critically examines South Korea's mandatory coding education policy as a case of vocational education reform. It adopts the Varieties of Capitalism (VoC) framework to explore how the state's industrial logic is embedded within education planning. The study draws on curriculum guidelines, policy documents, national development strategies, and government reports. These materials are analyzed through a qualitative document analysis method that focuses on institutional features and their alignment with the coordinated market economy model.

Rather than treating ICT education as an isolated innovation, this paper situates coding education within South Korea's long-term strategy to maintain competitiveness in global technology markets. By doing so, the study provides a structurally grounded understanding of how educational reforms intersect with national economic systems. It also offers implications for other countries seeking to implement vocational and ICT education under the banner of sustainable development.

Methodology

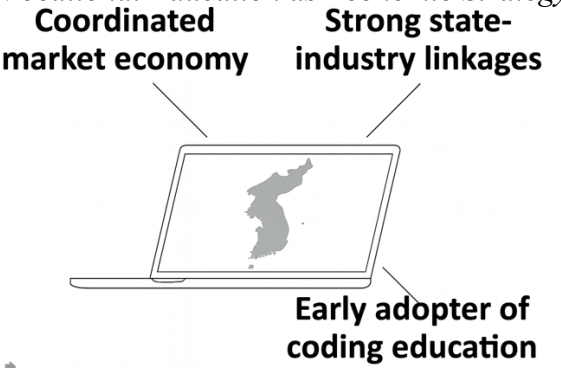
This study adopts a qualitative research design that treats education policy as a window into the broader political economy of South Korea. The analysis does not approach coding

education as a neutral or stand-alone digital literacy initiative. It conceptualizes the 2018 decision to introduce mandatory coding education in primary and lower secondary schools as a policy that is embedded in a coordinated market economy and in a long history of state-led industrialization. Within this perspective, vocational and ICT-related reforms are interpreted as instruments that support long-term strategies for technological upgrading rather than as isolated pedagogical innovations.

The research uses a document-based approach. The primary materials include national education policy documents, curriculum guidelines, government white papers, long-term human resource development plans, and strategy reports on the digital economy produced between 2010 and 2025. These documents cover the period in which coding education was first debated, piloted, and then integrated into the national curriculum. Additional sources include statistical yearbooks, OECD education indicators, and reports by international organizations that describe South Korea's ICT development and skills strategy (e.g., OECD, 2021; UNESCO, 2019). The selection of documents follows a purposeful strategy. The analysis focuses on texts that explicitly connect education reform with industrial policy, digital transformation, or human capital formation.

Figure 1

Vocational Education as Economic Strategy



South Korea is treated as a single-nation case that allows an in-depth examination of how one coordinated market economy translates economic priorities into education policy. The country represents an early adopter of mandatory coding education in basic schooling and has a strong record of export-oriented growth, large business groups, and dense ties between the state, firms, and education providers. This configuration makes South Korea a suitable case for applying the Varieties of Capitalism framework, which emphasizes institutional complementarities between production regimes, labor markets, and skill formation systems (Hall & Soskice, 2001). The case is not chosen as a statistical example. It is selected because it offers a theoretically rich instance through which the structural logic of ICT-oriented vocational reform can be explored.

Data analysis proceeds in two stages. First, the documents are read with open coding to identify recurrent references to skills, competitiveness, future industries, and digital transformation. Particular attention is paid to how coding, software education, and computational thinking are framed in relation to export industries, innovation policy, and the fourth industrial revolution. Second, these coded patterns are interpreted through the Varieties of Capitalism lens. The analysis asks how the texts express features that are associated with coordinated market economies, such as strategic coordination between the state and business, firm-specific skills,

and institutional support for long-term investment in human capital. This step links specific curricular decisions to broader mechanisms of economic governance.

The study also examines how policy actors are described and positioned within the documents. Ministries, local education offices, major conglomerates, and public agencies are analyzed as part of a network of institutions that co-produce vocational pathways. References to industry–university cooperation, public–private partnerships, and talent pipelines for strategic sectors are treated as evidence of this coordination. By tracing these linkages across multiple documents, the research reconstructs a policy narrative in which coding education functions as one node in a larger system that connects schooling to industrial upgrading.

The methodology has several limitations that shape the scope of the findings. The research does not include interviews with policymakers, teachers, or students, and it does not analyze classroom practices or learning outcomes. The focus remains on how the state and related institutions narrate and justify coding education at the level of policy texts. As a result, the study cannot evaluate the effectiveness of the reform in terms of student skills. Instead, it clarifies the institutional logic that underpins the reform and shows how that logic aligns with South Korea's coordinated market economy. This design is appropriate for the aim of the paper, which is to provide a structurally grounded interpretation of vocational ICT policy and to extend the application of the Varieties of Capitalism framework to a non-Western education system.

Results and Findings

The analysis of South Korea's coding education reform produced three main findings. First, the policy is closely embedded in the logic of a coordinated market economy rather than framed solely as a response to global digital literacy agendas. Second, the design and implementation of coding education reflect strong state and industry coordination that channels skills formation toward specific sectors of the economy. Third, the Varieties of Capitalism framework helps to explain why the reform appears ambitious in form yet conservative in its underlying institutional orientation.

The first finding concerns how the state framed mandatory coding education in high level policy documents. Government white papers and strategy reports link coding education directly to national competitiveness, innovation capacity, and the fourth industrial revolution (Ministry of Education, 2018; Ministry of Science and ICT, 2019). Policy texts repeatedly describe students as future human resources for artificial intelligence industries, advanced manufacturing, and digital exports. The official rationale rarely stops at individual empowerment or generic digital literacy. Instead, coding is described as a tool to secure national advantage in global value chains and in export markets. This pattern supports the interpretation that the reform operates as an economic upgrading strategy that is consistent with the expectations of a coordinated market economy (Hall & Soskice, 2001).

The second finding relates to institutional coordination between the state, large firms, and educational actors. Policy documents emphasize public private partnerships, cooperation councils, and joint curriculum development with major ICT and manufacturing companies. References to internships, industry linked contest programs, and company supported teacher training appear frequently in government reports. These initiatives position large firms as central partners in the design of the coding curriculum and in the provision of learning opportunities beyond the classroom. Such arrangements echo the role of employer associations

and large firms in classic coordinated market economies, where firms play an active role in vocational training and long-term skill formation (Hall & Soskice, 2001). In the Korean case, conglomerates function as key nodes that connect school-based learning with future employment pathways in the digital and manufacturing sectors.

The third finding concerns how the structure of the coding curriculum reflects vocational and economic priorities. Curriculum guidelines locate coding within technology and practical arts rather than as a separate humanities or enrichment subject. Learning objectives stress problem solving for real world applications, system thinking, and project-based tasks that resemble simplified versions of software development and automation processes. Advanced modules in some local implementations are connected to career exploration in software engineering, data analysis, and digital content production. The documents also show alignment between coding lessons in general schools and more specialized programs in Meister high schools and vocational tracks. This pattern suggests that coding education functions as an early layer in a broader pipeline of technical skill formation that runs through secondary and post-secondary vocational institutions.

Figure 2
Varieties of Capitalism

Applying the Varieties of Capitalism framework to these materials clarifies that the reform represents institutional continuity more than radical change. On the surface, mandatory coding education appears similar to reforms in liberal market economies that stress individual digital literacy and flexible skills. However, the Korean policy remains anchored in coordinated mechanisms. The state sets clear strategic goals, large firms participate in implementation, and schools integrate coding into structured pathways that support specific industries. The VoC lens shows that the reform deepens existing complementarities between education, industrial policy, and employment relations rather than dismantling them. Coding education becomes another instrument through which the state and major firms coordinate long term skill needs.

The findings also reveal a selective borrowing of global policy language. Government documents cite international agendas such as SDG 4.4 and global discourses about twenty-first century skills and computational thinking (United Nations, 2015). Yet these ideas are translated into a national context where export driven growth and industrial upgrading remain central. Digital skills are promoted, but they are framed as means to sustain the competitiveness of core

sectors rather than as neutral or universally defined competencies. This selective adaptation supports the argument that education policy mirrors deeper economic structures and coordination logics.

Finally, the findings point to specific implications for discussions of SDG 4.4. In the Korean case, coding education does appear to expand access to technical and vocational skills for young people. At the same time, the reform channels many of those skills toward a particular model of development that relies on large firms and coordinated industrial policy. The case suggests that policies which look similar on the surface may function very differently depending on the underlying economic institutions. Vocational education that uses ICT can support SDG 4.4, but its effects will depend on how it is embedded in each country's system of coordination between the state, firms, and educational institutions.

These findings gain additional meaning when they are read against the historical and structural context of South Korea. After the Korean War the state adopted a developmental model in which rapid industrialization depended on close coordination between government agencies and a small group of large firms (Amsden, 1989). Policies in the 1970s promoted heavy and chemical industries and linked access to credit and protection in domestic markets to export performance. This pattern created a strong expectation that education and training systems would supply the technical workforce needed for industrial upgrading rather than only provide general academic skills (Kim, 1997).

The state has continued to act as a central planner in the field of skills and education. Government strategies describe human resources as the main driver of growth because South Korea has limited natural resources. Long term plans for science, technology, and information industries place education at the center of economic policy and treat curriculum reform as a direct instrument of competitiveness policy (Ministry of Education, 2018; Ministry of Science and ICT, 2019). Coding education fits into this tradition because it is framed as a way to prepare future workers for specific sectors such as semiconductors, software, and artificial intelligence. The reform is therefore consistent with the coordinated market economy pattern in which the state steers skill formation in line with industrial priorities rather than leaving it solely to individual choice or market signals (Hall & Soskice, 2001).

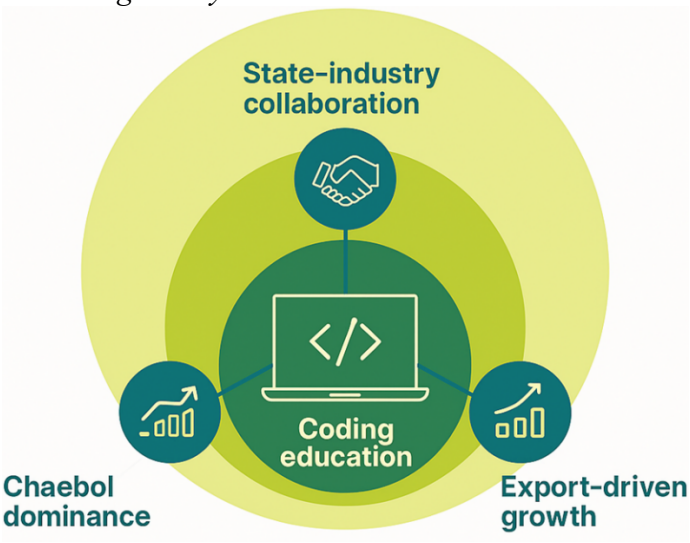
Large business groups have also played a decisive role in the way skills are produced and used. Conglomerates such as Samsung and Hyundai have long operated internal research centers and training institutes and have offered structured career ladders for engineers and technicians (Chang, 1993). Public reports on coding education refer to partnerships with these firms for curriculum development, teacher training, and student contests. These links indicate that the school based coding curriculum is expected to feed into existing channels of firm based training and recruitment. The result is a multi layered system in which basic coding skills in compulsory education connect with more specialized vocational programs and then move into firm specific training within major companies.

This structural context helps to explain why coding education in South Korea appears ambitious while still reinforcing existing institutional arrangements. The state uses the language of global digital literacy and SDG 4.4, but it embeds the reform in a long standing pattern of export driven growth and firm centered skill formation. The Varieties of Capitalism framework clarifies that the Korean case is not only a story about innovation in pedagogy. It is a case in which a new curriculum reflects and reproduces a coordinated system of economic governance. For debates on SDG 4.4 this suggests that digital and vocational reforms need to

be interpreted through each country's political economic structure. Similar policies may lead to different outcomes when they are placed in different configurations of state capacity, industrial organization, and education systems.

In this light, coding education functions as a mirror of Korea's institutional arrangements rather than a stand alone pedagogical experiment. The policy links classroom content to national goals of export upgrading and digital transformation. Curriculum documents describe coding as a core competence for work in semiconductors, software, and artificial intelligence rather than only as a general digital literacy skill. This supports the view that vocational education in South Korea operates as an economic strategy that serves coordinated growth and industrial upgrading.

Figure 3
CME-Aligned Hybrid Model

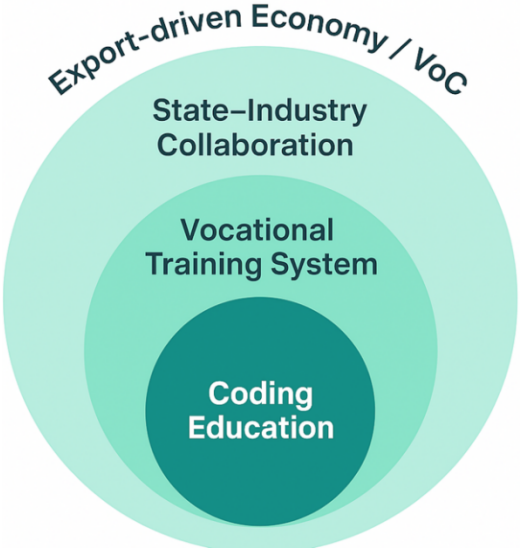


The application of the Varieties of Capitalism framework clarifies Korea's position as a coordinated market economy with hybrid features. Policy texts and white papers frequently highlight cooperation among ministries, business federations, and universities in the design and implementation of coding education. These patterns match the logic of coordinated systems that rely on strategic collaboration instead of pure market competition in the fields of training, innovation, and wage setting (Hall & Soskice, 2001). At the same time, the strong role of export competition and global value chains shows that Korea does not reproduce European coordinated models in a simple way. The case therefore extends VoC debates to an Asian context and illustrates how coordination can operate under conditions of high external competitiveness.

The findings also show that education policy can be read through the same institutional lens that comparative political economy research has usually applied to labor markets and welfare regimes. Coding education in Korea reflects long term patterns of state led steering, firm centered skill formation, and export driven industrial strategy. It is not only a response to global discourses on digital literacy and SDG 4.4. It is also an adaptation of those discourses to an existing system of coordination between the state, large firms, and educational institutions. This result suggests that future research on vocational and ICT based reforms in other countries should examine how similar policies are filtered through different institutional configurations rather than assuming uniform effects across contexts.

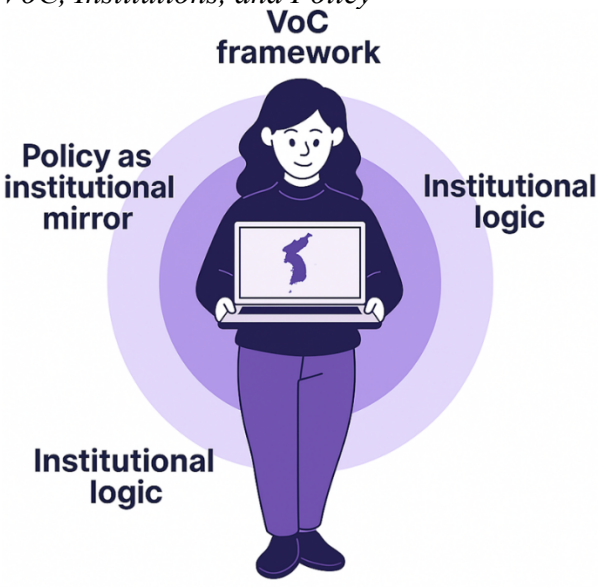
In this structural context the emergence of coding education in South Korea can be better understood through the Varieties of Capitalism framework, which explains how national models of coordination shape reform trajectories in different policy domains (Hall & Soskice, 2001). Coding education sits within a wider vocational training system that has long been organized through dense ties between the state, large firms, and education providers.

Figure 4
Coding Education in Korea's Skills System



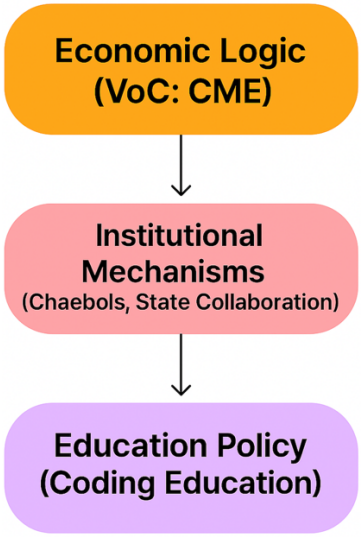
The policy therefore reflects an existing logic of strategic coordination in which the government designs skill formation not only for individual learning but also for industrial competitiveness. When viewed in this way coding education appears as one element in a sequence that links economic strategy, institutional arrangements, and sectoral policy. This reading supports the argument that policy often functions as a mirror of underlying institutions rather than as an independent or purely technocratic choice.

Figure 5
VoC, Institutions, and Policy



The content, timing, and framing of coding education in Korea reveal the priorities of a coordinated market economy that relies on highly skilled labor, firm specific training, and export oriented upgrading. Coding education is not simply a reaction to global enthusiasm for digital literacy. It is embedded in Korea's particular system of economic coordination in which state led planning, firm based innovation, and education policy are closely connected.

Figure 6
From Economic Logic to Coding Policy



Understanding coding education as an embedded reform clarifies why Korea moved relatively early to mandate coding in schools and why this reform is likely to reinforce existing patterns of vocational skill formation rather than replace them.

Implications & Conclusion

The analysis of South Korea's coding education policy shows that vocational education that uses ICT functions as part of a broader economic strategy rather than as a simple classroom innovation. Coding education supports export oriented growth and digital industrial upgrading because it channels young people into skills that match the needs of large firms and technology intensive sectors. This finding is consistent with the logic of coordinated market economies in the Varieties of Capitalism framework, where skill formation and firm strategies are closely linked to long term national development paths (Hall & Soskice, 2001).

These results have several implications for the implementation of SDG 4.4. International debates often present digital skills and coding education as universal solutions that every country should adopt in a similar way. The Korean case suggests that such policies work most effectively when they are aligned with existing patterns of coordination between the state, firms, and educational institutions. SDG 4.4 calls for an increase in the number of youth and adults with relevant technical and vocational skills (United Nations, 2015). The Korean experience shows that relevance is not only a question of curriculum content. It is also a question of how skills are linked to concrete employment pathways within a particular political economy.

The findings also highlight the limits of simple policy transfer. Coding education in South Korea is anchored in strong state industry collaboration, dense links between universities and large firms, and a history of export oriented industrial policy. Countries with liberal market

economies that rely more on competitive markets and weaker forms of coordination are likely to experience different outcomes even if they adopt similar ICT based curricula. Developing countries with large informal sectors or limited state capacity may face even greater mismatches if they import high tech vocational models without the supporting institutional infrastructure. The Korean model can offer ideas for how to connect vocational education with growth strategies, but it cannot serve as a ready made blueprint.

At the same time, the study does not suggest that countries should avoid ICT based vocational reforms. Instead, it argues that such reforms should be designed with careful attention to institutional complementarities. Policymakers need to ask how new digital curricula will interact with existing labor market institutions, firm level training practices, and state development strategies. The Korean case illustrates that vocational education can reinforce a particular growth model when these elements are aligned. It also suggests that misalignment may produce weaker results or even deepen inequalities if only some groups gain access to employment that uses new skills.

The study makes a theoretical contribution by extending the use of the Varieties of Capitalism framework into the field of education policy. Previous VoC research has focused mainly on production regimes and labor markets in Europe and North America (Hall & Soskice, 2001). By applying VoC to a non-Western case and to the domain of schooling and vocational education, the analysis supports the claim that education policy can be read as a mirror of institutional structures. Coding education in South Korea reflects long standing patterns of coordination between the state and large firms. It also reflects a national preference for strategies that link human capital formation with export competitiveness. This perspective invites further work that treats education ministries, school systems, and curricula as part of the institutional architecture of coordinated or liberal market economies.

There are also important methodological and empirical limits to this study. The analysis is based on document review rather than interviews with policymakers, teachers, or students. It therefore reconstructs institutional logic and policy intentions but does not directly measure classroom level practice or labor market outcomes. Future research could combine this structural perspective with qualitative fieldwork in schools and firms or with quantitative analyses of student trajectories in vocational and ICT related tracks. Comparative work that examines other Asian economies with different configurations of state capacity and industrial organization would also deepen the argument. Such studies could test how far the Korean pattern travels and where it breaks down.

Despite these limits, the findings offer a set of cautious implications for global education debates. Efforts to achieve SDG 4.4 will benefit from promotion of digital skills, but they will be more effective when reforms are grounded in each country’s political economic structure. The Korean case shows that coding education can support inclusive and future oriented skill formation when it is embedded in a coherent system of coordination across the state, firms, and education providers. It also warns against the uncritical diffusion of high tech vocational models that ignore institutional context. A more realistic approach to SDG 4.4 will recognize that there are many possible paths to building relevant skills and that each path must reflect national histories of development, governance, and industrial organization.

In conclusion, this study has interpreted South Korea’s mandatory coding education policy as a structural feature of its coordinated market economy rather than as a purely pedagogical reform. Viewing the policy through the Varieties of Capitalism framework clarifies how

vocational education can function as an economic strategy that supports export oriented upgrading. The case therefore contributes to both educational research and political economy by linking debates on ICT based learning to deeper questions about institutional design and development.

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