

Technological Innovation in Public Education in the Era of COVID-19: Focusing on Distance Education Policy in South Korea

Hyejin Shin*

Abstract As the COVID-19 continues spreading, Korea's Ministry of Education (MOE) announced that all public schools, including elementary, middle, and high schools, must begin on April 9, 2020, via online teaching for the first time in the nation's history. There were opposite views among educators regarding the unprecedented attempt to start school online. This study intends to analyze the strategies and policies of distance learning in the public education sector using the experiences in Korea, which has been dealing with the COVID-19 pandemic over the past six months, and thus presents educational implications that may be of interest other countries in the post-COVID-19 era. This study first conceptualized the distance education policy in two domains: technological infrastructure and technological teaching and learning, and then examined what specific policies have supported distance education in school settings. For the analysis of policies supporting distance education in Korea, this study analyzed the relevant documents that include the annual plan and press release uploaded on the website of MOE from early March until early August. Accordingly, 13 documents that contain the distance education policy were analyzed in this study. To provide equal opportunities for all students and ensure fair resource allocations, technological inequality should be discussed in the context of educational inequality. Finally, this study looks at how strategies and policies could be related to educational equality and equity.

Keywords Distance education, Technological innovation, Educational innovation, Equality and Equity, COVID-19

I. Introduction

As COVID-19 hits the world, one of the most significant changes in education

Submitted, August 26, 2020; Accepted, August 30, 2020

* Chief Executive Officer, MUREPA KOREA, Seoul, Korea; hjshin03@murepa.com



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is the application of distance learning in school settings. From K-12 to higher education levels, more than 150 million students worldwide could not attend schools as of April 9 (UNESCO, 2020). Starting February 2020, the number of patients infected by COVID-19 in South Korea (hereafter Korea) increased at a rapid rate, when social distancing became a pivotal recommendation to prevent the disease spreading at the national level. With the emphasis on social distancing in the entire society, one serious issue raised in the public education area was whether schools would start a new semester in March of 2020.

As the COVID-19 continues to spread, the Ministry of Education (MOE) mandated to postpone the schools' starting date three times. Finally, it announced that all public schools, including elementary, middle, and high schools, must begin on April 9, 2020, to deliver lessons online for the first time in Korean history, instead of March 1 when the school year traditionally begins. The decision can be seen as a central government's safety effort to protect students as much as possible, preventing learning gaps among students without delaying the regular academic schedule stemming from COVID-19 (Ministry of Education, 2020).

Regarding the unprecedented attempt to start school online, there were opposite views among educators. While distance learning can provide an opportunity to accelerate educational innovation in public education using new technologies, a concern is related to the lack of experience to prepare distance education, resulting in educational inequality. Anxiety and expectation have led to controversy and criticism from various perspectives among the education-related personnel. New educational standards required for directions and strategies in the post-COVID-19 era have been discussed based on the unprecedented and unpredictable experiences so far.

Internet connectivity is important for distance learning, but guaranteeing the stability of the connection is an issue. Even among economically-prosperous countries such as Canada, the United States, the United Kingdom, among others, the absence of internet connectivity has slowed down the shift to distance learning during the pandemic, which still continues to be a major challenge in handling distance learning. In view of massive and unexpected closures due to COVID-19, countries and communities affected have been forced to seek rapid settings for various digital learning platforms (Jandrić, 2020). However, relying on connectivity for distance learning is not a total solution during school closures; technologically-facilitated distance learning is likely to increase inequality in learning continuity (Mundy & Hares, 2020).

Hence, distance education in post-COVID-19 must be considered in the context of equality and equity that are the main values of public education. Here, while the concept of equality focuses on 'sameness,' that of equity focuses on 'fairness.' When a group focuses on equality, everyone has the same rights, opportunities, and resources. Equity, on the other hand, provides a

disadvantaged group of people with more resources that fit to their circumstances. Understanding the distinction between two concepts is essential to resolve issues existing in the disadvantaged group for educational settings, such as minority students, students with special needs, and students from low socio-economic status (Waterford, 2019). Technological innovation can address new technological gaps such as digital literacy and the capability in information and communications technology (ICT). Based on the concepts of equality and equity, which provide equal opportunities for all students and fair resource allocation, we have to ensure that technological inequality does not accelerate educational inequality. Rawls (1971) emphasized a differential procedural definition that requires more support for the vulnerable group where it is necessary to discuss what the equity should be in technological innovation in post-COVID-19; based on his “differential distribution for fairness” more support for facilities such as budget and infrastructure for the underprivileged should be provided.

Therefore, this study seeks to analyze the strategies and policies of distance learning in the public education sector using the experiences of Korea, which has dealt with the COVID-19 pandemic over the past six months, that presents educational implications needed for other countries in the post-COVID-19 era. This study first conceptualized the distance education policy in two domains: technological infrastructure and technological teaching and learning, and then examined what specific policies have supported distance education in school settings. Finally, this study discussed how strategies and policies could be related to educational equality and equity.

II. Background and Research Framework¹

Due to COVID-19, most countries recommended that teachers and students stay at home as part of social distancing. In mid-March 2020, when COVID-19 was predicted to become a global pandemic, the Organization for Economic Cooperation and Development (OECD) worked with Harvard University and various private educational institutions such as Save the Children and the web-based Information Science Education (WISE), and collaborated with teachers, principals, superintendents, professors, and the civil society from 98 countries. A survey was conducted through online targeting organizations and educational

¹ This section summarized findings in A framework to guide an education response to the COVID-19 pandemic of 2020. OECD of Reimer and Achleicher (2020).

policymakers and administrators.

In many countries, governments required that both students and teachers do not come to schools for two to four weeks, renewable, while in a few cases suspended was unlimited. However, only four countries – Comoros, Honduras, the Russian Federation, and Singapore – allowed school attendance as of March 20. Also, the policy response in some countries was mixed regarding the decision to let schools suspend classes: in Argentina, schools were open with teachers delivering lesson resources; in Australia and Benin, governments suspended activities in schools, while some schools continued; and in Bahrain, students were asked not come to schools, but teachers, except for mothers, continue to come.

It seems difficult to receive support from the government or network of schools while being encouraged to use online resources because the guidelines of governments are not grounded in the realities of schools (Reimer & Achleicher, 2020), using online platforms or broadcasting educational contents via television. Platforms and online sites for the educational contents were deployed for academic instruction, while some students still depended on broadcasting systems such as radio, podcasts, and public television stations.

From the survey, the biggest challenges in the education response during COVID-19 include the availability and management of technological infrastructure as well as the balance for students between digital and physical activities. On the other hand, instruction via new technologies, innovative tools, and the autonomy of students who manage their learning are positive aspects in distance education.

Therefore, coping with COVID-19, the educational response to distance education can be divided into two domains: technological infrastructure and technological teaching and learning. The domain of technological infrastructure includes elements of digital devices, networks, online platforms, etc. The domain of technological teaching and learning includes instructional packages, Internet accessibility, online content, etc. The domains and components in each domain are identified in Figure 1, where a research framework analyzing distance education policy in Korea is presented. From the analysis, this study discussed what implications could be addressed in terms of educational equality and equity in response to COVID-19.

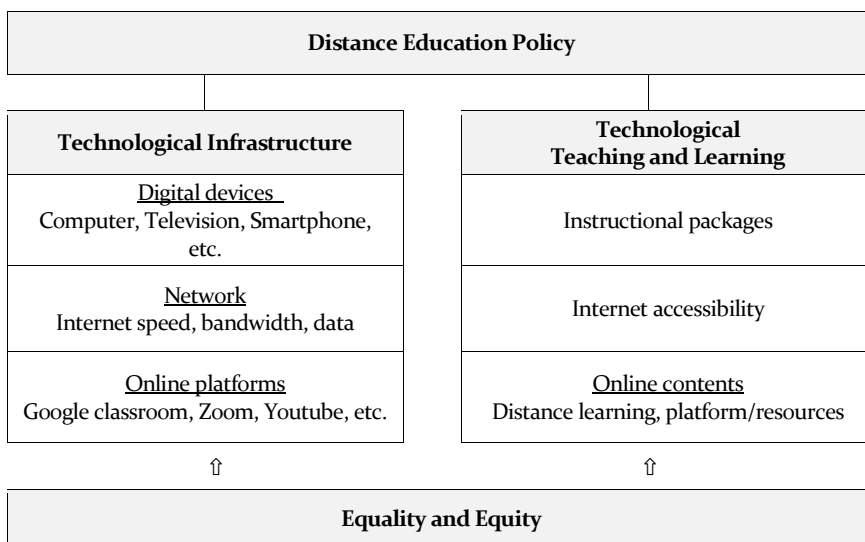


Figure 1 Research framework analyzing distance education policy

III. Distance Education Policy Responding to the COVID-19 Pandemic in Korea

For the analysis of policies supporting distance education in Korea, this study analyzed policy documents that include the annual plan and press releases uploaded on the website of MOE from early March until early August. Accordingly, 13 documents that contain distance education policy material were used in this study.

Since the first introduction of online school opening in Korean history, MOE has devoted its efforts to establish a distance learning environment for students. Essential in an online class is the provision of the distance environment where online tools can be used. The environment includes a platform that provides online classes, devices that include tools needed to run the platform, and access that connects to the platform. Also, a stable data network is needed for the environment. The Ministry of Science and ICT (MSIT) has actively cooperated with MOE to support establishing the technological learning environment so that distance education can be available to all students under the public education system. In consultation with Korea's leading telecommunication companies, such as KT, SKT, and LGU+, a support system was provided to access educationally-relevant broadcast sites such as Educational Broadcasting

System (EBS) using smartphones without any extra cost. Unlimited data service was provided to allow users to freely download educational contents by accessing an education site that provides an online education platform. Also, a TV channel was temporarily opened to support viewing EBS education contents through real-time TV.

The government surveyed the digital device status of each student in each household. They supported the provision of devices such as laptops, PCs, and smartphones to families with students who do not have these devices at home. In particular, children of low-income families are provided the devices free of charge so that they can view the online classes. Smart pads were sponsored for low-income families with the cooperation of large private companies such as Samsung and LG Electronics.

Indeed, Korea has been in a very vulnerable situation in utilization of technological innovation in schools, even though the country is known as a global player IT technologies, leading 5G technology, and where the whole population uses smartphones. For example, most schools in Korea do not have WiFi installed, so a desktop computer dedicated to teachers in the classroom has been used as an educational tool instead of surfing for global information via the Internet. Also, because security problems, using computers was thoroughly controlled in public offices and, thus, accessing external sites and using contents inside the school was constrained. However, as access and use of online education platforms become an essential factor due to COVID-19, the absence of WiFi experienced in schools so far has been a barrier for teachers. Therefore, the restrictions and regulations need to be removed in terms of educational innovation so that MOE can allow access to external sites to search instructional content for teachers as well as install a router on the LAN port in the classroom.

The MOE provided guidelines regarding use for distance class in schools: (1) real-time interactive class, (2) content-oriented class, and (3) task-oriented class. Table 1 shows the operation guidelines for each type.

Table 1 Guideline of teaching and learning by MOE

	Direction
Real-time interactive class	<ul style="list-style-type: none"> Utilizing a real-time distance education platform, video lessons are conducted between teachers and students, and immediate feedback such as real-time discussion and communication (e.g., ZOOM, Google, Webex, etc.)
Content-oriented class	<ul style="list-style-type: none"> (Lecture type) Students watch designated recorded lectures or learning contents, and teachers check to learn contents and give feedback (Lecture + activity type) Remote discussion such as comments after watching learning content (e.g., EBS lectures, self-produced materials, etc.)
Task-oriented class	<ul style="list-style-type: none"> Assignments and feedback that enable teachers to check students' self-directed learning content in context according to the achievement standards for each subject online (e.g., Present assignments → Perform student activities such as reading appreciation, workbooks, and study materials → Submit learning results → Check teachers and give feedback)
Etc.	<ul style="list-style-type: none"> May be determined separately according to the school conditions and the Office of Education

Each school could use various types of distance classes without restrictions in consideration of the achievement standards for each subject and online learning environment for learners. However, it was emphasized that the participation of students in the class, such as a real-time interactive class, should be activated. Offices of Education instructed that schools make efforts to build a supportive environment such as remote class content, remote class platform, smart device rental, etc., for students. Above all, it was recommended that classes could be operated flexibly in consideration of the school level, the level of learning content, the learning burden of students, and school conditions. Also, Offices of Education instructed schools to make efforts for a fair management of learning and care of the disadvantaged group, such as students with disabilities and multicultural students.

Students who experience challenges to participate in distance classes, such as students with disabilities and students in the lower grades at elementary school, should receive high-quality distance education with customized support fit for individual learning with the support of parent counseling. Student evaluation was made when schools return to the face-to-face class using contents that had been learned during the distance class.

MOE and each Office of Education established support plans to strengthen competency, which includes providing counseling and training for teachers so that distance classes can be effectively managed at schools for different levels.

Also, as a way to reinforce the future education capacity of prospective teachers, a future education center of the teacher training college is being established, and a project to strengthen the distance education capacity of prospective teachers is being promoted (NewsDigm, 2020)

IV. Equality and Equity in Distance Education Policy

The distance education support policies of Korea examined so far have focused on ensuring not to create differences in technological environments of learners in terms of device ownership, Internet accessibility, and so on as the provision of equal learning opportunities. As introduced earlier, the main values of public education should deal with equality and equity because technological innovation can bring gaps in the use of new technologies. They take the shape of varying digital literacy levels and incapacities in utilizing ICT. To provide equal opportunities for all students and ensure fair resource allocations, technological inequality should be discussed as part of educational inequality. In particular, for this process, MSIT, electronic and telecommunications companies, and various administration and local governments should actively cooperate with relevant organizations to attain equality and equity in public education; the analytic results are summarized below.

In terms of equality, the following policies support distance education:

- 1) Supporting unlimited use of educational content without worrying about data usage by three telecom companies
- 2) Providing real-time EBS educational content on IPTV and viewing without additional charge
- 3) Establishing a wireless network and use of Wi-Fi in all the classrooms
- 4) Extending the use of distance education solutions by domestic software companies
- 5) Allowing access to external sites for remote classes at school settings
- 6) Developing teacher competency reinforcement programs needed for distance classes
- 7) Enhancing teaching capabilities for distance class from the stage of preparatory teachers in order to contribute to bridging the education gap
- 8) Operating a call center to prevent access errors during distance classes
- 9) Stabilizing the communication network through business cooperation with related organizations such as EBS and Korea Education & Research Information Service (KERIS)
- 10) Including Learning Management System (LMS) platform, e-learning center, EBS online class

11) Supporting online textbooks

In terms of equity, the following policies support distance education:

- 1) Active support for smart device rental and Internet communication expense for low-income students
- 2) Sponsorship of Samsung Electronics and LG Electronics for smart device rental for low-income families
- 3) Mentoring support of Edutech for the vulnerable groups
- 4) Allowing to utilize school facilities for students who are staying in rural and fishing villages where IT infrastructure is not installed at their homes
- 5) Providing subtitles for remote classes, sign language, and braille for students with visual and hearing impairments and disabilities
- 6) Device and Internet support for low-income students
- 7) Distance class operation differentiated by the type and degree of disability
- 8) Reinforcing multi-lingual language information for multicultural students.

Figure 2 summarizes these support policies, divided into technological infrastructure and technological teaching and learning.

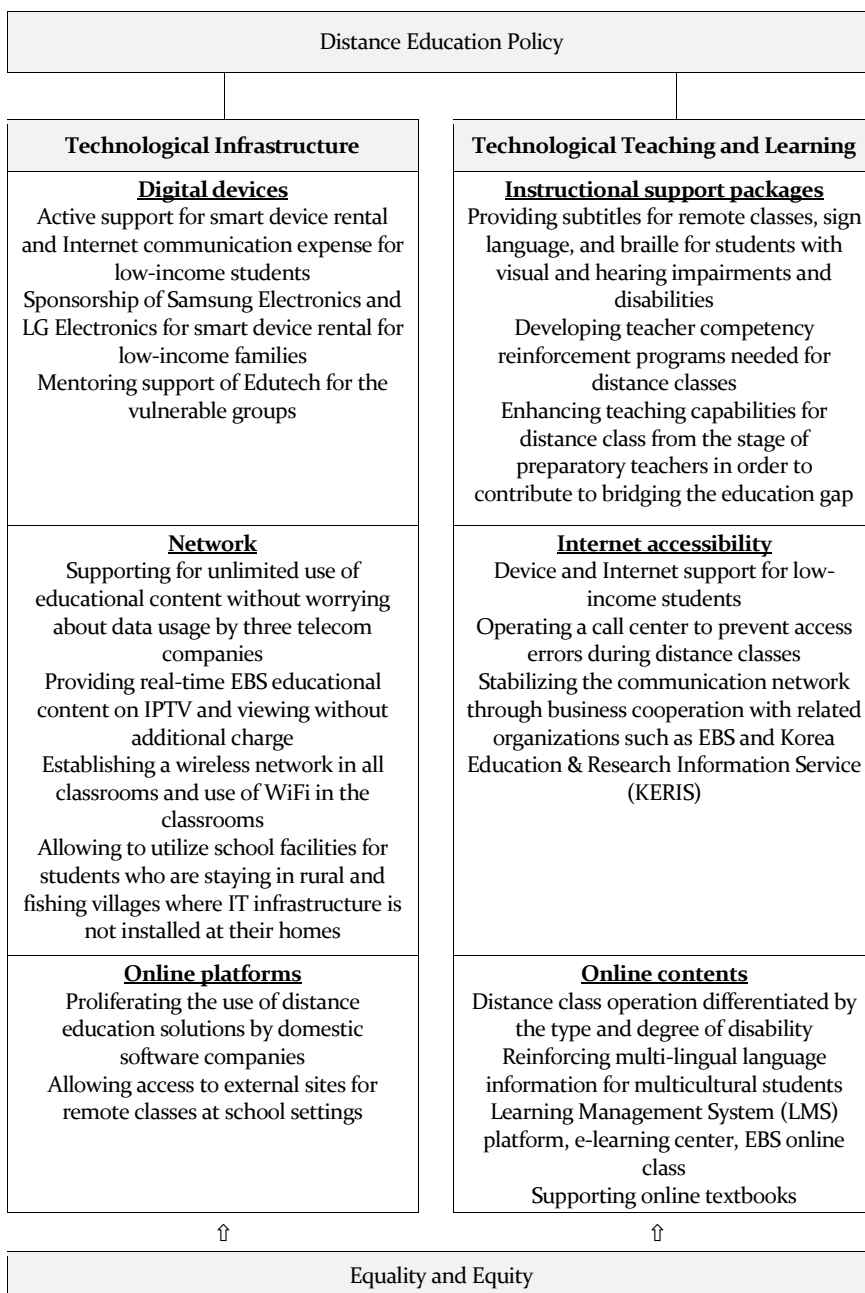


Figure 2 Distance policy support by the Ministry of Education

V. Conclusion and Implications

Given that inequality in Internet connectivity only accelerates the gap of educational opportunities existing between the rich and the poor when we turn to distance learning, Mundy and Hares (2020) pointed out the governments should 1) simplify curricula and modify learning goals, 2) make learning materials readily available, 3) use radio, television, and SMS to amplify learning, 4) make use of family engagement, usually an under-utilized resource, and 5) encourage outreach and support from teachers, school leaders, and districts.

The Korean Ministry of Education has attempted a bold challenge of online school opening to minimize student learning gaps while ensuring student safety as much as possible. In Korea, where distance education is not yet familiar, the attempted online school opening has raised conflicting views between expectations and concerns due to the drastic challenge in public education innovation using new technologies. Still, it has shown the possibility of success in technological innovation for Korean public education. In particular, it is worth noting that, while the distance learning in public education is not familiar in Korea, the new trial has been actively promoted to support teaching and learning tools without any child left behind. Especially, it was valuable to see efforts minimizing educational barriers through cooperation among public and private entities outside the public education sector.

However, it will be essential to deeply investigate how the distance policy defined in the policy documents could be implemented in the school settings. For example, it would be possible to cause an educational gap for learners due to their family support that includes the capability to use a remote educational system supported by their parents. Unfortunately, this study has its limitation to not address this type of issue that requires exploring how a policy could be implemented in various school settings in-depth. Ball (1993) suggested that policy is defined as an integrating process, all including 'policy as discourse' and 'policy as text' and further, 'policy effect' that is derived within the 'policy practice.' This integration approach emphasizes that there might be a gap between policy-makers and the implementation of the policy, so that it is necessary to constantly focus on whether a policy established by the document is operating efficiently in the policy field. In this matter, it is necessary to explore how well the distance education policy of MOE has been implemented in school settings so that the policy would operate in practice.

At this moment, Korea should pay attention to the following points based on the experience in post-COVID-19. First, complementary elements of public education must be included in Internet-based educational content, such as how to search useful educational information via the Internet, Internet-based ethics, etc. School education should be shifted from knowledge-centered education with instructors who teach how to catch a fish, and which was important in early

industrial societies, to learner-centered education that introduces various ways to catch a fish. Second, MOE should focus on providing broad guidelines and directions only, trusting and fully supporting the school sites. Also, it should focus on supporting contents and areas where deficiencies and disabilities appear at the national level only. Third, various sanctions and regulations must be lifted so that a flexible application suitable for the school and regional settings is possibly made. Fourth, MOE should provide various platforms for sharing numerous cases of application carried out at the school base. Fifth, distance education should not seek to obtain the results of learning, such as excessive assignments, that are deeply dependent on the internal and socio-economic characteristics of learners.

Now, distance education is no longer a type of learning that is temporarily used as a countermeasure against COVID-19. Distance education will be established as a permanent form for future education. Schools will focus on the online platform. It should be a mobile platform to provide study counseling, review, preview, performance evaluation, and even one-on-one depth counseling. Mobile is personalized and available to most students. The mobile platform will be the future of online education eventually (Hong, 2020). It is essential that education involves ethical awareness of how to use various information on YouTube as educational materials, select online materials and think critically, and find sources and cite online content materials in the Internet-based learning space. Last, but not least, technological innovation needs to be connected with innovation in public education.

As Hargreaves (2020) pointed out as follows,

“We should think about technology, [...] we should make technology a public universal and free of charge for those who otherwise could not afford it as a human rights, rather than government money going to private companies to enhance their game in a way that causes inconsistency in access to people who want technology outside of schools within their rights. [...] The public education is about building a society, building a nation, building a community, and not simply about using technology for individual private choice anytime, anywhere, give or take. So let’s focus on what’s right on investment, not austerity, on public universal, free access to technology, on the here and now are not just anytime, anywhere, on investing in all teaching.”

Non-face-to-face instruction can be applied as an opportunity and crisis toward equality and equity in education. As Teräs et al. (2020) pointed out, “if education is seen as a conveyor belt to create graduates for the capitalist

economy, then education might look like something to be fixed with technology in order for it to be more efficient. If education is seen as something that should promote holistic human growth for a more democratic and just society, leveraging digital technologies might look somewhat different: connecting people to discuss, learn, and tackle common problems together.” When designing future education in response to COVID-19, before highlighting the development of equipment that promotes the development of more efficient educational tools along with better technologies, technological innovation should focus on ways to consider education for all so that technological innovation can narrow the educational gap. No-one should be limited by barriers in place and everyone should be equally provided with the opportunities, where infinite information through Internet clicks should be guaranteed. At the same time, gaps in educational opportunities due to the absence of equipment and the restricted data connections should not happen. Therefore, technological innovation should be focused more on ways to reduce the gaps in educational opportunities, overcoming the limitations discussed above.

Technological innovation has provided the possibility of a hyper-connected society that enables active international exchanges without locational barriers and without any time constraints via the Internet. Now is the time for investment in technological innovation to innovate public education. Indeed, more financial support toward the public education is needed so that technological innovation does not lead to another technological gap.

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Appendix

List of Korean documents applied for the policy analysis

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