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# White Paper on Children Education:

## Education Transformation and Outlook After the Pandemic

## — An Overview of Education in Taiwan


**Wen-chih Tseng · PCA Life Assurance Co.**

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## Education Transformation and Outlook After the Pandemic — An Overview of Education in Taiwan

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PCA Life Assurance Co.

保誠人壽

百年歷史的保誠集團，在無數個歷史戰亂的時刻，帶給人們最安心的力量

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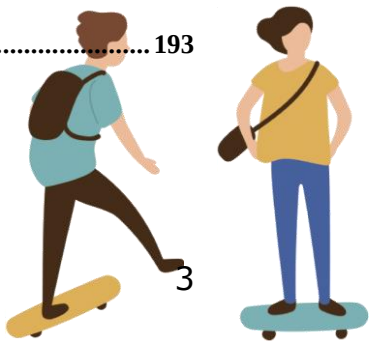
# Table of Contents





# Acknowledgements

Our hope is to give our children a better future. When PCA Life reached out and asked me to compile their white paper on children's education, they expressed their beliefs in the importance of shaping mindsets on creating a better future for our children and their hopes for contributing to education transformation in the post-pandemic era through industry-academia collaboration and initiatives. I would like to thank PCA Life for inspiring and supporting this industry-academia project and for the successful completion of this white paper on children's education. PCA Life is an excellent corporation that attaches importance to sustainable ESG development, giving us an opportunity to look forward to a better future for our children's education.

Amidst the severe global education crisis caused by the COVID-19 pandemic, determining the framework for this white paper on children's education was easy but completing the white paper within a time frame of eight months was incredibly challenging. The completion of this white paper relied on the educational landscapes during the COVID-19 pandemic (the right time), the resources provided by PCA Life (the right place), and, more importantly, the avid support from various people (the right people).

I would like to hereby express my gratitude to our project members - Wei-ting Liao, Pin-fan Chen, and Yue-lin Tsai - for their contributions. They invested their valuable time and energy into collecting information, interviewing teachers, students, and parents, and helping me tirelessly to bolster the content of this white paper. I'd also like to thank Li-ting Chen and Gui-hua Liu for their tireless efforts and assistance with all the tasks, big and small, relating to this project. It is their contributions, for which I am sincerely grateful, that allowed me to miraculously complete this challenging mission in such a short time frame.

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Lastly, I'd like to thank all the teachers, students, and parents interviewed for this white paper. They shared their remote learning experiences without reservation, detailing the complex and convoluted process of learning during the pandemic. The frailty and resilience exemplified by their experiences made our outlook for education in the post-pandemic era a reality. The report is only made possible with the support and sharing of our anonymous interviewees. I would also like to take this opportunity to dedicate this white paper to all educators and workers in the education system that have worked ceaselessly to ensure educational continuity during the pandemic. You have our deepest gratitude and respect.

— Dr. Wen-chih Tseng, Counseling Psychologist & Professor at the NCHU Department of Educational Psychology and Counseling

# Abstract

In writing this white paper on children education, PCA Life Assurance strives primarily to propose education transformations and visions for the post-pandemic era. The report outlines the impact of the COVID-19 crisis on education and the educational innovations that emerged from the pandemic; analyzes experiences and provides critical information for educational transformation; looks into developments in education in the post-pandemic era; and explores how we can strengthen system resilience in an ever-changing world to help children prepare for their futures, facilitate diverse and meaningful learning for education actors, and align with visions for creating a more resilient nation.

The COVID-19 pandemic has sent global education into a state of chaos. No country was spared from its widespread impact. Forced to adopt remote education, a practice that many were new to, schools and teachers faced many questions and struggled to operate software/ hardware, design online courses, grade papers, and assess student performances. Parents and students were equally confounded and were forced to figure out how to learn and work from home under lockdown measures.

In the face of such unprecedented challenges, students, parents, educators, private organizations, and governments worked together, generating never-before-seen technologies, developments, and innovations in the field of education. Most education systems were flexible, adjusting school calendars, rethinking courses, tests, and assessment methods, and adopting blended learning. Education systems and cultures varied drastically across countries but all countries were able to develop new channels connecting students, families, schools, and local authorities to plan a new norm for their futures.

In the past two years, policies and mindsets were forced to change at an accelerated pace. The historical baggage and mental barriers that had once made reforms in education entirely impossible were removed in an instant. Education systems, having always lagged behind in innovations and developments, started adopting digital learning, a once slow-progressing practice that now became a vital pillar sustaining global education a few years earlier than expected. Digital education in the field of education will no longer be a simple alternative or assistive tool to traditional education, but a way to give more learning opportunities to the public. It allowed us to see the varied functions of formal education from a different

perspective, one that transcends time and space and strengthens the concept of learning as an activity.

It is apparent that digital technologies embody incredible potential for change and can create learning opportunities for many more people. Unfortunately, many problems belie educational innovations that were conjured up in short time spans and not all students were able to benefit equally. Students suffering from screen fatigue pretended to participate in classes but their quality of learning took a dive for the worse. Teachers lacking digital teaching experiences delayed their feedback and provided a worse learning experience to children. Remote education during school closures was a contingency plan at the cost of long-term learning losses, which is especially severe in young children without the ability to learn independently. For disadvantaged students without the necessary resources, parental monitoring, and parental support, we saw a significantly higher percentage of these students lagging behind academically and suffering from interrupted learning.

When schools were forced to adopt remote education, various school services that students originally benefitted from were stripped from them as well. This includes opportunities for social interactions and building relationships, extracurricular art and sports activities, regular and balanced meals, and services to maintain physical and mental health. The socio-emotional health of students around the world was impacted and we saw growing cases of violence against children, obesity, internet addictions, and cyberbullying. Having lost the support of schools and peers, many children often felt lonely and helpless as their mental health began to deteriorate.

The pandemic perfectly exhibited the challenges of maintaining education and exposed inequalities in education systems, exhibiting that remote education cannot ever replace in-person instruction. It also showed that face-to-face interactions with teachers, interactions with peers, and various school services are integral to the learning and development of students.

In the post-pandemic era, global education is at a turning point and on the road to recovery. This means that we may continue to adopt the same educational approach we used before the pandemic or take advantage of this extraordinary opportunity to invest in education transformations. In this historical moment, disruptive changes are clearly emerging from a few critical fields:

**1. Transformations in the way we learn:** A rising number of children are learning from online interactions such as simulations,

games, virtual realities, augmented realities, etc. Though in-person instructions are irreplaceable, most children have expressed a liking to the freedom granted by remote education and find it wonderful that they can choose what and how they learn.

**2. Transformations in competency requirements:** A rising number of educators have strong digital competencies and consider the ability to apply digital technologies in classrooms and teachings as a priority for professional development. Governments and societies are also increasingly aware of the importance of strengthening self-regulation and socio-emotional skills in personalized learning.

**3. Transformations in homework and assessments:** Digitalized homework and assessments are important tools to improve learning and are therefore on the rise. More and more digital education platforms or online software are providing assessment tools to improve student learning and learning analysis using AI and big data so teachers can digitalize homework and assessments or convert tests into games for students to play and compete. These digital tools are also being used to provide invaluable learning feedback.

**4. Transformations to reduce inequalities:** Digital gaps between students, parents, and teachers have exacerbated educational inequalities but also urged societies to shift their focus in educational inequalities from the distribution of traditional resources to resolving threats from the digital gap. To reduce learning gaps and counteract the complexity and diversity of challenges faced by disadvantaged students, education measures facilitating equality and inclusion are becoming more customized.

**5. Transformations to facilitate mental health:** The pandemic has disrupted schooling and challenged the ability of teachers and students to respond and adapt rapidly. Greater resilience in teachers, students, and parents enables them to better embrace change and strike a balance between their work and lives. This has also made fostering resilience an unquestionable priority in promoting mental health.

The disruptions brought on by COVID-19 present an opportunity for change and have allowed us to understand innovative approaches to achieve widespread transformations in the education system and realize education technologies. We can use this opportunity to reassess the goals of education systems, redesign teaching

fundamentals, and learn from past experiences and solutions implemented around the world to help us.

The COVID-19 lesson also reminds us that we need to foster a healthier relationship between humanity and nature and that education must teach our children that change is intrinsic to the world we live in. More importantly, in the post-pandemic era, the world is becoming more complex, diverse, and uncertain at a faster pace. Education opportunities for children may change suddenly and unexpectedly. As such, education systems and learning environments must become more resilient to foster the necessary skills for children to flourish in an unpredictable landscape.

Given such understanding, this white paper proposes a "Multi-system Framework to Make Taiwan Education More Resilient" based on literature review and surveys. The framework aims to serve as an answer to the challenges and opportunities in the post-pandemic era and provide critical education conducive to the formulation of education policies to strengthen resilience in education systems, learning environments, and children. There are three visions, six plans, and fourteen strategies in the "Multi-system Framework to Make Taiwan Education More Resilient":

**1. A More Resilient Education System**

A resilient education system enables countries to pursue social and economic prosperity and helps people live productive, happy lives. Firstly, we must strategically develop a general information management system for smart learning to strengthen the collection of learning data and communication of critical information, ensuring both can be practically applied. Strategies to achieve this plan include: Developing learning assessment tools and integrating data collection platforms; conducting requirements analysis for education stakeholders and conveying critical information with intentions; and helping actors in the education system understand assessment data and apply the data to improve learning.

Secondly, to strengthen the resilience of education systems, we must consider weaknesses in the education system's linear learning pathway where we have a standardized starting point and end point to provide children with dynamic learning pathways that adapt with evolving times. Strategies to achieve this plan include: Providing flexible and diverse learning opportunities to ensure successful transitions within the education system; and strengthening connections between education, society, and the job market to support student ambitions and foster realistic career aspirations.

## 2. A More Resilient Learning Environment

A resilient learning environment facilitates more diverse and meaningful learning for all education actors. We must prevent creating an island out of schools and strive to create an education services network expanding around the school to create comprehensive, in-depth, and long-term partnerships. Strategies to achieve this plan include: Promoting coordinated education services and connecting more partners; and providing one-stop services to satisfy student needs more comprehensively. These strategies allow us to bring learning environments outside of school campuses and build a sprawling education services network.

To strengthen resilience in learning environments, we must also value people and processes, fostering entrepreneurship and resilience in educators, empowering them to adapt to local contexts, and giving them the authority to adjust how strategies are implemented. Strategies to achieve this plan include: Encouraging educators to share innovations so that effective innovative practices can flourish; and supporting educators achieve work-life balance to strengthen their resilience.

## 3. Fostering More Resilient Children

Resilient children can adapt to various tasks and environments and even capitalize on the opportunity to explore their potential. This requires inclusive learning and equal education so that children can leverage opportunities from learning environments to create their own opportunities. Strategies to achieve this plan include: Using digital resource platforms to provide personalized learning to children; and continuing to provide additional support and dedicated guidance to children with special needs.

To strengthen resilience in children, we must give children more autonomy and responsibilities so that they can shift between learning tasks and environments and learn proactively. Strategies to achieve this plan include: Cultivating self-regulation in children to strengthen their sense of self and drive their own learning; regularly and systematically listening to children's voices; and increasing a sense of belonging in children towards the broader learning environment and cultivating children into responsible digital citizens. These strategies can help children connect with multiple worlds and strengthen their cognitive and socio-emotional skills so that they can explore their full potential.

The world is becoming more complex and volatile. Disruptive changes are pushing many children to the brink of crisis but also

presenting a massive opportunity for us to progress welfare for humans. The education initiatives proposed in this white paper for the post-pandemic era are more an invitation to collaborate and open up our minds than it is a blueprint for our future. We need students, parents, teachers, and the public to come together to develop and boldly share new ideas to map out education in the post-pandemic era. We would like to urge everyone to come up with new ideas and create a vision for the future of education. We must work together to put education at the core of public policies. Only then can we shift development focuses, achieve education transformation, and create a better, fairer, and happier future for our children.

# Overview of Education in Taiwan

## Key Facts

**Education** is a set of invisible wings that enables our children to fly and opens up their prospects in the world and imagination of their future.

— Minister of Education: Pan Wen-Chang —

# Key Facts: Overview of Education in Taiwan

## Statistics from Taiwan's education system from 2021-2022[1] :

### 1. 4.17 million (4,171,630) students in the education system (please refer to Figure 1)

- 582,000 at the pre-primary level, 1.1191 million at the primary level, 587,000 at the lower secondary level, 586,000 at the upper secondary level, 5,000 in special education, and 1.211 million in universities, colleges, and institutes of higher education.
- Net enrollment rates at the primary, lower secondary, upper secondary, and tertiary level are 97.69%, 97.90%, 94.76, and 75.84%, respectively.
- On average, 178 out of 1,000 persons are students.

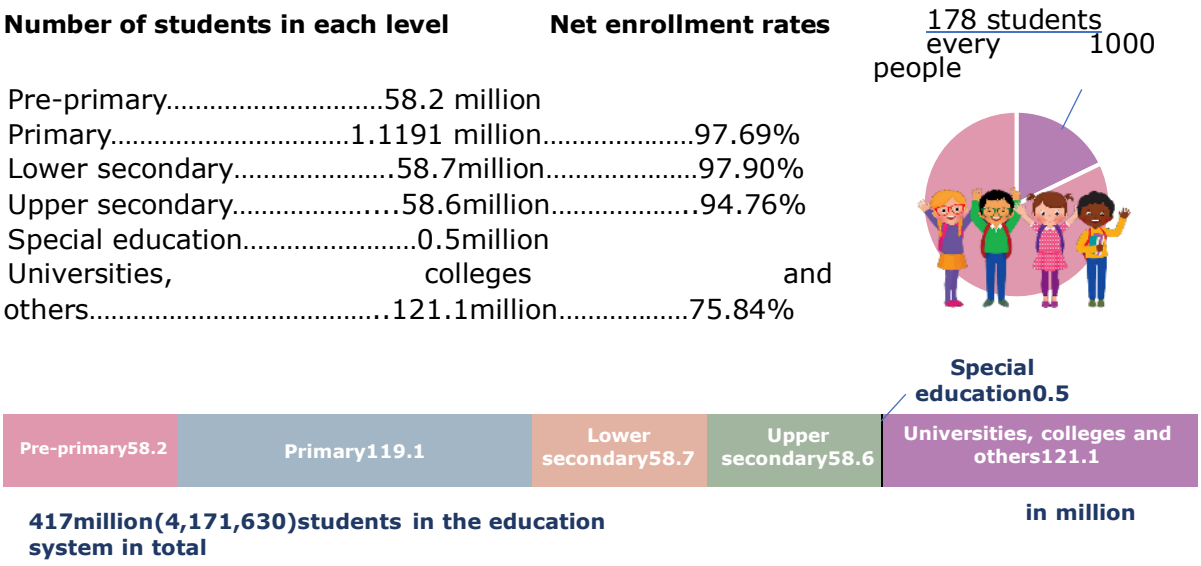



Figure 1 Student Distribution across Different Levels of Education in Taiwan

### 2. 10,964 schools in Taiwan (Figure 2)

- 6,507 pre-primary schools, 2,626 primary schools, 734 lower secondary schools, 514 upper secondary schools, 28 special education schools, 149 colleges and universities, 8 religious

schools, and 398 open universities, cram schools, and continuing education colleges.

- Public pre-primary schools: 37.1%; public primary & middle schools: 98.7%; public high schools: 58.9%; and public universities & colleges 31.5%.
- Schools in Taiwan employ 300,000 teachers and 80,000 staff members.

**Number of schools in each level**

Pre-primary school .....6,507
Primary school .....2,626
Lower secondary school .....734
Upper secondary school .....514
Special education school ..... 28
Colleges and universities .....149
Religious school ..... 8
Open universities, cram .....398
schools, and continuing
education colleges

**Percentage of public and private schools**

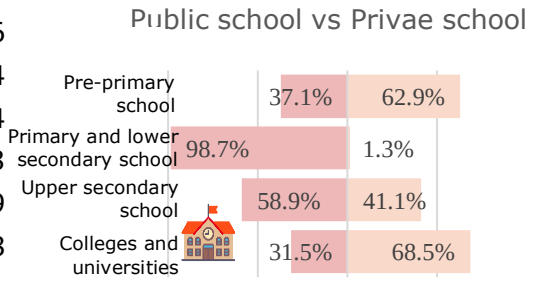



Figure 2 Number of Schools & Public/ Private School Percentages at All Levels of Education in Taiwan

## Since 2010, Taiwan has achieved significant progress in the field of education

### 1. Students are achieving better education outcomes

- On average, students from Taiwan score significantly higher in reading, math, and science than competing countries in international comparative research[2].
- In county- and city-level assessments of student achievements in 2021, the average passing rates among third graders were 59% and 49% in Mandarin and math, respectively; the average passing rates among fifth graders were 52% and 58% in math and Mandarin, respectively[3].

### 2. Teachers are better trained[4]

- The percentage of teachers with a master's degree is rising every year. In the 2021 academic year, 8.9% of kindergarten teachers and over 60% of teachers in elementary, middle, and high schools had a master's degree; and nearly 80% of teachers in universities and colleges had a Ph.D.

- The average number of students per class (class size) is also declining each year. In elementary schools, middle schools, and kindergartens, classes have an average of 25.39 students per class.

- The student-teacher ratio is also decreasing every year, with each teacher instructing an average of 13.88 students (figure 3).

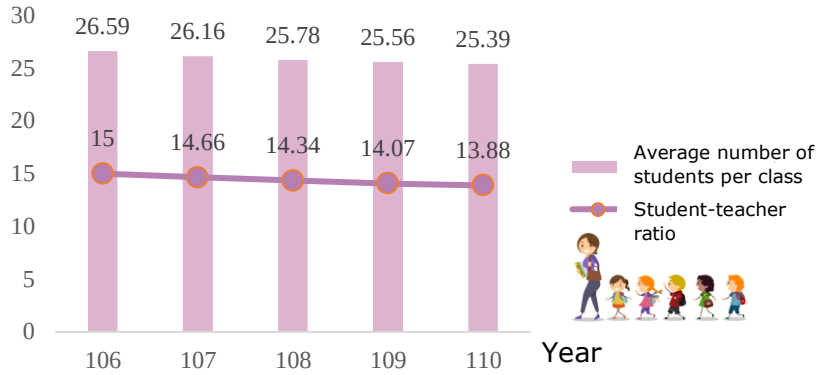



Figure 3 Historical Class Sizes & Student-Teacher Ratios in Pre-primary, Primary, and Secondary Schools

## 3. Schools are securing more funding

- The average education expenditure per student is also rising each year. In 2011, the average education expenditure per student is US$5,647. In 2020, that figure rose by 36% to US$7,702[5] (figure 4).

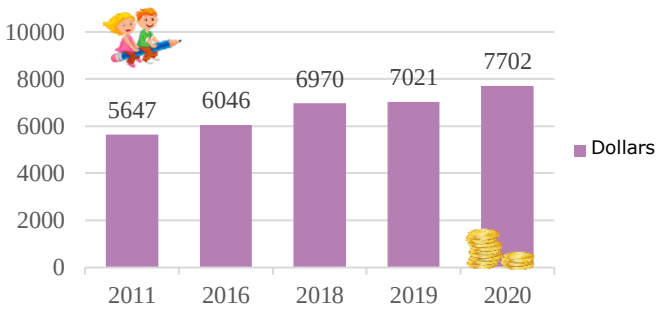



Figure 4 Historical Data on the Average Education Expenditure per Student in Taiwan

- 3,700 schools joined the Education Savings Account program, raising funds from the public to help disadvantaged students in their schools with educational pursuits. As of 2022, donations have exceeded NT$15.5 billion, and 84,000 cases have received donations[6].

- Disadvantaged students also receive subsidies for lunches; over 400,000 students receive lunch subsidies each year

## Major Policies on Education in Taiwan between 2022-2023

### 1. Programs in response to sub-replacement fertility

To mitigate issues arising from sub-replacement fertility in Taiwan, reduce the financial burden on parents, and support the National Child Care Policy for Ages 0-6, the Executive Yuan amended and approved the "Sub-Replacement Fertility Plan" on January 29, 2021. To fulfill the goals of "added quota, reduced burden, and increased benefits," the plan involved three major targets: expand low-cost education and childcare services, reduce the cost of education, and increase childcare subsidies.

### 2. National Basic Education (12 years) directives

The new student-oriented curriculum was implemented in 2019 and strengthens scenario cognition, integration, exploration, and implementation experiences to encourage active learning, social participation, and a pursuit of the common good in students. The new curriculum's vision statement, titled "Facilitate Self-actualization, Adaptive Learning to Individual Fulfillment, and Life Long Learning," aims to cultivate the necessary knowledge, skills, and mindsets in students that will help them adapt to life and challenges in the future.

### 3. New Southbound Talent Development Program

The Ministry of Education formulated the New Southbound Talent Development Program to provide high-quality education, support inter-flow between professionals, and encourage bilateral exchanges between young scholars and students. The Program also aims to facilitate collaborations on education between Taiwan and partners under the southbound policy to strengthen bilateral relations.

### 4. Bilingual 2030

The Bilingual 2030 policy aims to strengthen the English communication skills of the citizens and further bolster the global competitiveness of Taiwan. The policy involves establishing benchmark bilingual schools and academies, providing subject courses in English at pre-primary, primary, and secondary levels, recruiting native English professionals, and implementing self-directed English learning and examination mechanisms.

**We must strive to help every child reach their potential**

1. **Too many students cannot find the purpose of learning in schools**

- In international comparative studies, Taiwanese students scored significantly lower than the averages scores from competing countries in. The ambition of our students, especially in disadvantaged students, are far lower than society's expectations. Around one-fifth of disadvantaged students with outstanding grades do not expect to pursue higher education[7].

- Many students are dissatisfied with their lives and learning. In the international comparative study, students in Taiwan have lower levels of satisfaction and growth mindsets than the average scores from competing countries; over 80% of students in Taiwan have a strong fear of failure[8].

2. **Too many children face challenges in acquiring new types of learning skills[9]**

- In the international comparative study, teachers in Taiwan conduct fewer educational activities to help students acquire new types of learning skills (inspiring critical thinking in students, fostering self-directed learning in students, and diverse assessments) when compared to the average of competing countries.

- Less than 30% of teachers will empower students to use information and communications technologies to complete projects.

## 2022-2023 Future Prospects of the education in Taiwan

### Future Prospects

Education is an endeavor to help children grow in a safe environment and find their anchors in life so as to have the courage to pursue and achieve their dreams. The 12-year Basic Education Curriculum Guidelines are a critical driving force behind the general education reform in Taiwan, where both teachers and students are moving towards a better future. The MOE will keep encouraging teachers to develop professionally, supporting them with necessary resources in classrooms, and upgrading the environment of learning for better quality education. The MOE carefully maps out policies that will shape education into a driving force for individual growth and a cornerstone of national development.

Excerpt from Ministry of Education Republic of China（2022）。*Education in Taiwan (2022-2023)*。

# Chapter I

# Introduction

天行健，君子以自強不息。

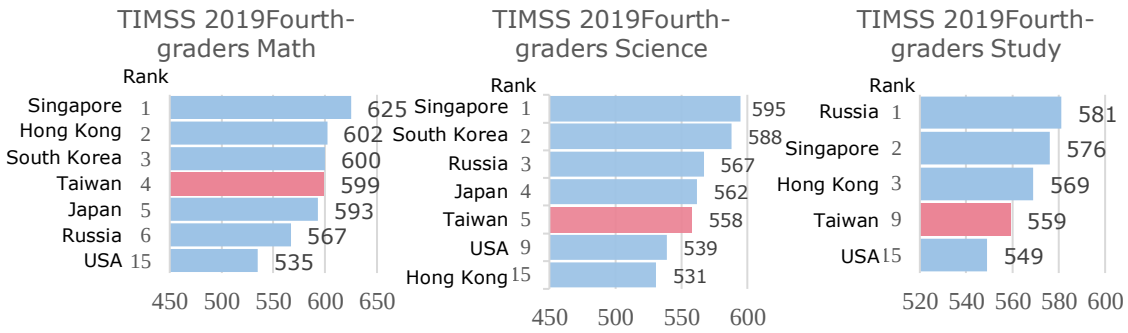
地勢坤，君子以厚德載物。

《易經．象傳》

# Chapter I Introduction

In the decade before the COVID-19 pandemic, education in Taiwan had achieved substantial development with extensive resources provided by the government through policies. Between 2011 and 2019, students in Taiwan delivered outstanding performances in international comparative studies[10]. For example:

- In the *2016 Progress in International Reading Literacy Study* (PIRLS), fourth-graders from Taiwan scored 559 in reading literacy and ranked 9th in the world[11].
- In the *2018 Programme for International Student Assessment* (PISA), 15-year-old students in Taiwan scored 503 in reading literacy and ranked 17th in the world; 531 in math and ranked 5th; and 516 in science and ranked 10th[12].
- In the *2019 Trends in International Mathematics and Science Study* (TIMSS), as shown in Figure 1-1 below: fourth-graders scored 599 and 558 and ranked 4th and 5th in math and science, respectively[13].



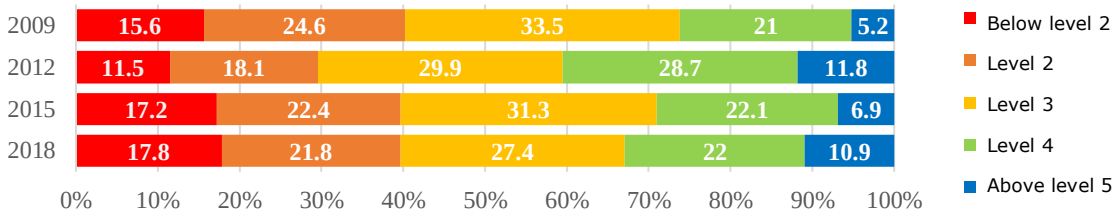

Note: The scores above are scale scores with an average of 500 and a standard deviation of 100. The scale score is converted from raw scores

Figure 1-1 2019 International Comparative Study - Taiwan's Math & Science Scores

Reading, math, and science literacy are critical for social engagement and enable children to take part in more diverse courses; these literacies can empower children to receive further training, find employment, and lead productive and fulfilling lives. As such, reading, math, and science literacy are important tools that drive social mobility. Our student's success in reading, math, and science can be attributed to Taiwan's comprehensive education system: robust education policies from the government, dedication from teachers, and the great emphasis on education in Taiwan's society and culture have laid the cornerstones for national development and Taiwan's competitive advantage.

Yet, Taiwan still has a long and challenging road ahead to becoming a world leader in education. As Angela Gurría, secretary general of the Organization for Economic Co-operation and Development points out in the foreword for the PISA report: "Clearly, all countries and economies have excellent students, but few have enabled all students to excel[14]." The OECD is an international organization that holds PISA every three years to evaluate whether 15-year-olds are equipped with the critical competencies for social engagement. PISA covers reading, math, and science literacy. Results from PISA indicate the quality and equity of learning outcomes attained around the world, and allow educators and policymakers to learn from the policies and practices applied in other countries.

In *PISA 2018: Insights and Interpretation*, Taiwan is shown to have a larger gap between the top 10% and lowest 10% of students (by score) than most participating countries. In the past few years, Taiwan's education has been able to increase the percentage of high achievers but unable to decrease the percentage of low achievers (figure 1-2). It is therefore evident that achieving greater equity is the most important and urgent task for Taiwan's education. For disadvantaged students, education is an important opportunity for achieving success. The central promise of the 2030 Agenda for Sustainable Development by the U.N. is to leave no one behind[15]; every child is equally important. Unfortunately, more than 1.5 billion students across the planet are or have been affected[16] by school and university closures due to the COVID-19 pandemic that broke out at the end of 2019 and spread to the world in 2020. The disparity in student achievements has therefore widened as a result of digital inequalities, undermining the hard-earned progress in educational equity around the world.



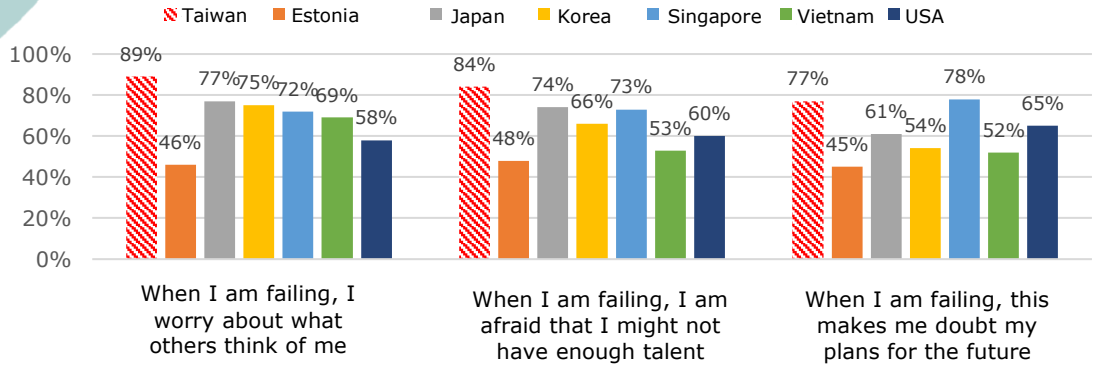

*Draw; Source: OECD, PISA 2018 Results*

Figure 1-2 Distribution of Taiwan Reading Score from the 2018 PISA

After *PISA 2018: Insights and Interpretation* was released in December 2019, in addition to the performance of students around the world, Taiwan media also focused heavily on another headline: "Taiwanese Students Rank First in Fear of Failure[17]." Fear of failure

refers to worrying about what others think, being afraid of not having enough talent, or doubting their plans for the future (figure 1-3).

- When I am failing, I worry about what others think of me: 89% agree or strongly agree
- When I am failing, I am afraid that I might not have enough talent: 84% agree or strongly agree
- When I am failing, this makes me doubt my plans for the future: 77% agree or strongly agree



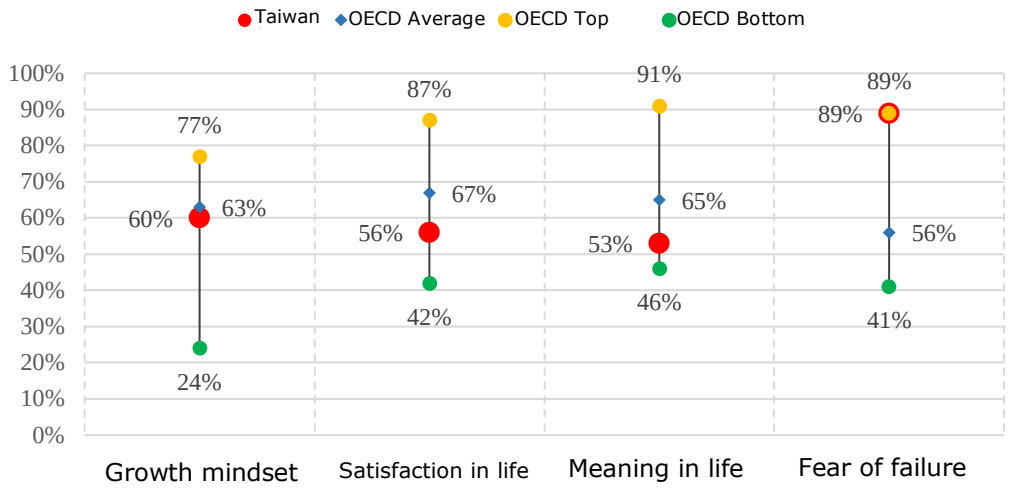

*Draw; Source: OECD, PISA 2018 Results*

Figure 1-3 International Comparison of Students' Fear of Failure

Our children's intense fear of failure shows that Taiwan's education desperately needs to foster resilience in students. Resilience is the process and outcome of successfully adapting to difficult or challenging life experiences[18]; and the ability of people, households, communities, countries, and systems to mitigate, adapt to, and recover from shocks and stresses[19]. Education can help students understand that life is a continuous cycle of trying, failing, adapting, learning, and growing. Education is a critical way to strengthen cognitive, social, and emotional resilience in students. We must foster resilient students and teachers through education and build a more resilient education system to respond and adapt to future crises. Especially after the COVID-19 pandemic, when students' cognitive, social, and emotional development has been disrupted, related learning losses may have a long-term negative and compounded impact on the future welfare of many students. As such, many education systems in the world are facing major resiliency challenges[20].

How students judge their abilities, and how afraid they are of failing, can shape their feelings, motivation, and behavior[21]. The OECD, therefore, provided a special report to explore what school life means for students' lives and learning[22]. In this report, we discover that the socio-emotional health of too many of our students is

affected by their fear of failure. The root cause is that 60% of our students do not have a growth mindset (i.e., students don't believe that their intelligence and abilities are something that they can change). These important factors that reflect personal resilience are inextricably tied to our student's relatively low satisfaction in life, lack of purpose in life, and strong fears of what others think when they fail (figure 1-4). The excessive pursuit of excellence in education may come at the cost of our student's well-being.



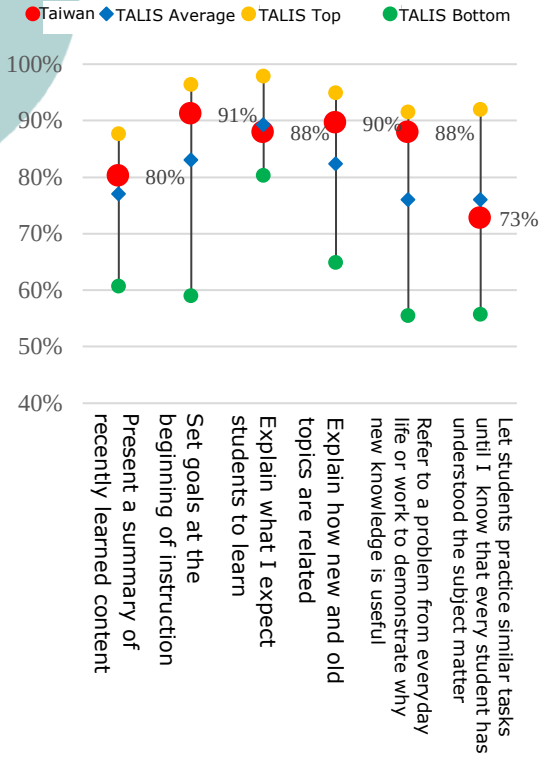

Note : 1. Growth mindset : Students reported the extent to which they agree ("strongly agree", "agree", "disagree", "strongly disagree") with the following statements: "Your intelligence is something about you that you can't change very much". 2.Satisfaction in life : Percentage of students who got 7-10 scores in the rating scale of satisfaction in life. 3.Meaning in life: Students reported the extent to which they agree with the following statements: "My life has clear meaning or purpose"; "I have discovered a satisfactory meaning in life"; and "I have a clear sense of what gives meaning to my life". These statements were combined to form the index of meaning in life. 4.Fear of failure : Students reported the extent to which they agree with the following statements: "When I am falling, I worry about what others think of me". 5. Source: *OECD, PISA 2018 Database*

Figure 1-4 International Comparison of Students' Well-being and Growth Mindset

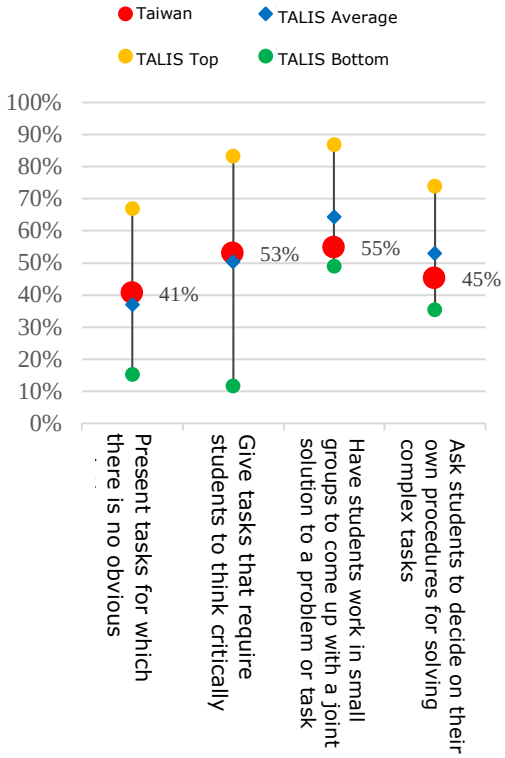
As such, cultivating outstanding and professional educators is the top priority of education systems around the world. Taiwan's education system is currently filled with teachers with strong academic credentials and most teachers have strong personal and social motivations. This is something that we should be proud of. Yet, teachers in Taiwan largely rely on clear and direct teaching activities and prefer passive learning methods that focus on rote memorization, rarely inspiring cognitive abilities in students, such as guiding students to think critically, cultivating self-directed learning in students, and empowering students to use information and communication technologies to complete projects or homework. Teachers also rarely utilize teaching activities with diverse assessments[23] (Figure 1-5). This is indeed concerning in an age

where technology is evolving rapidly as students will need to have the ability to drive the current innovative economy. With the impact of the COVID-19 pandemic, the advent of digitalized education was accelerated. This long lingering concern has now become a pressing matter.

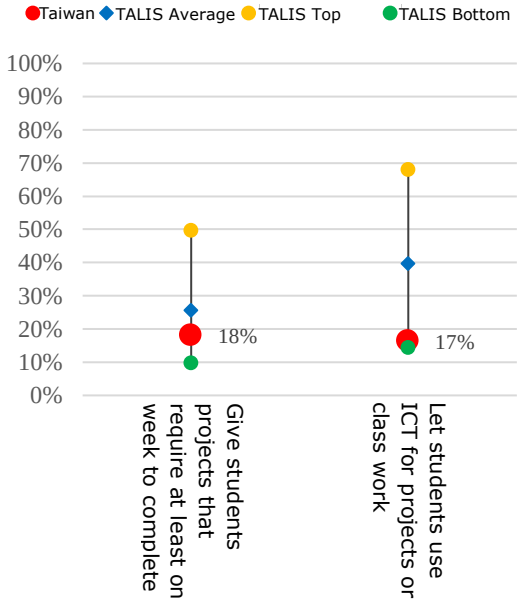
(1) Clarity of instruction



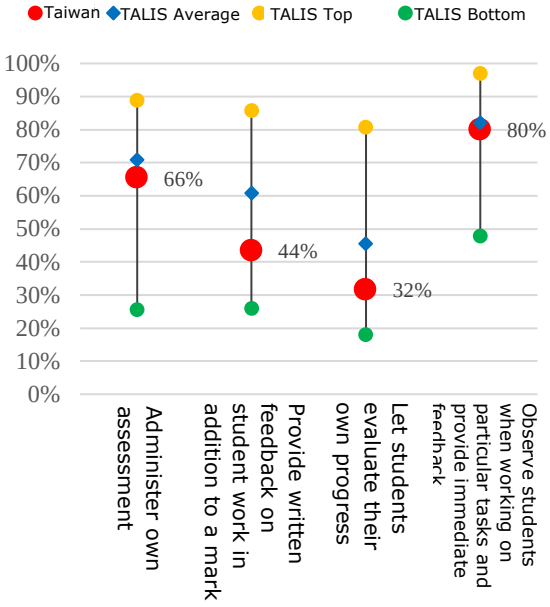

(2) Cognitive activation




(3) Enhanced activities




(4) Teachers' assessment practices




Source: *OECDiLibrary,TALIS 2018 Results (Volume I)Teachers and School Leaders as Lifelong Learners*

Figure1-5 Percentage of Teachers who “frequently” or “always” Use the Practices Above in Their Class

The COVID-19 pandemic was an unexpected test of unprecedented scale on the world’s education system. The crisis, completely unforeseeable, was contained by response measures implemented at all levels. Schools were forced to suspend classes and turn to remote education and online learning, a natural response to the crisis. And we were able to ensure that students could continue to learn even in the most remote areas. Yet, will this crisis be a turning point for the education system and foster real change or will we return to square one after the pandemic eases? In this watershed moment, we must reflect thoughtfully on our past experiences. This is a once-in-a-lifetime opportunity. Countries around the world responded to the crisis through comprehensive and cross-agency approaches. We can either leverage the collective experience to reconsider the overall goals, functions, and content of education and rebuild an education system that can better respond and adapt to the post-pandemic era or miss out on an incredible opportunity.

This white paper provides a target and framework for how education in Taiwan can transform and develop, striving to foster equity and well-being without compromising the pursuit of academic excellence. Excellence, equity, and well-being are three transitional and development targets that are a blueprint for how we can respond to a world that will constantly be in a state of imbalance after the pandemic. The COVID-19 pandemic has changed our views on education. Education now must be prepared for unexpected shocks, the changing future, and transformations in economies, societies, and technologies. In the post-pandemic era, resilience provides students and education systems with the flexibility, intelligence, and responsiveness they need to thrive in change. As such, this white paper will explore the impact of COVID-19 on education (Chapter II) and the transition of education around the world (Chapter III); set forth a multi-system framework for resilience (Chapter IV); and provide a conclusion and suggestions for the future (Chapter V). The multi-system framework for resilience will outline strategies and policies that can foster resiliency in students and education systems and can serve as a guideline for achieving the transitional and development targets of excellence, equity, and well-being.

## Thoughts on Education

The COVID-19 pandemic is a warning that preparing for the foreseeable and unexpected future is no longer simply an option. In the future, we can expect to see more impacts and unexpected events, whether it be new pandemics or natural disasters from extreme climates. The world's ecosystems are being destroyed and experiencing changes. Presented to us is the urgent challenge of building ecosystems that can adapt in the face of disruption and change, and education must be prepared for environmental impacts. As such, the OECD published *Education Policy Outlook 2021*, urging that, just like people, our educational institutions and education systems need to become more resilient to succeed amid unforeseeable disruptions. In *Education Policy Outlook 2021*, OECD's Director of Education and Skills - Andreas Schleicher - emphasizes that resiliency can build critical capacities in students and educations systems, such as the capacity[1]:

- To navigate between modernizing and disruption
- To reconcile new goals with old structures
- To foster innovation while recognizing the inherently conservative nature of the education systems
- To leverage potential with existing capacity
- To reconfigure the spaces, the people, the time, and the technologies to educate learners for their future, not our past.

Excerpt from：OECD (2021). *Education Policy Outlook 2021: Shaping Responsive and Resilient Education in a Changing World*. OECD Publishing. https://doi.org/10.1787/75e40a16-en

# Chapter II

## Impact of Covid-19 on Education

飄風不終朝，驟雨不終日。

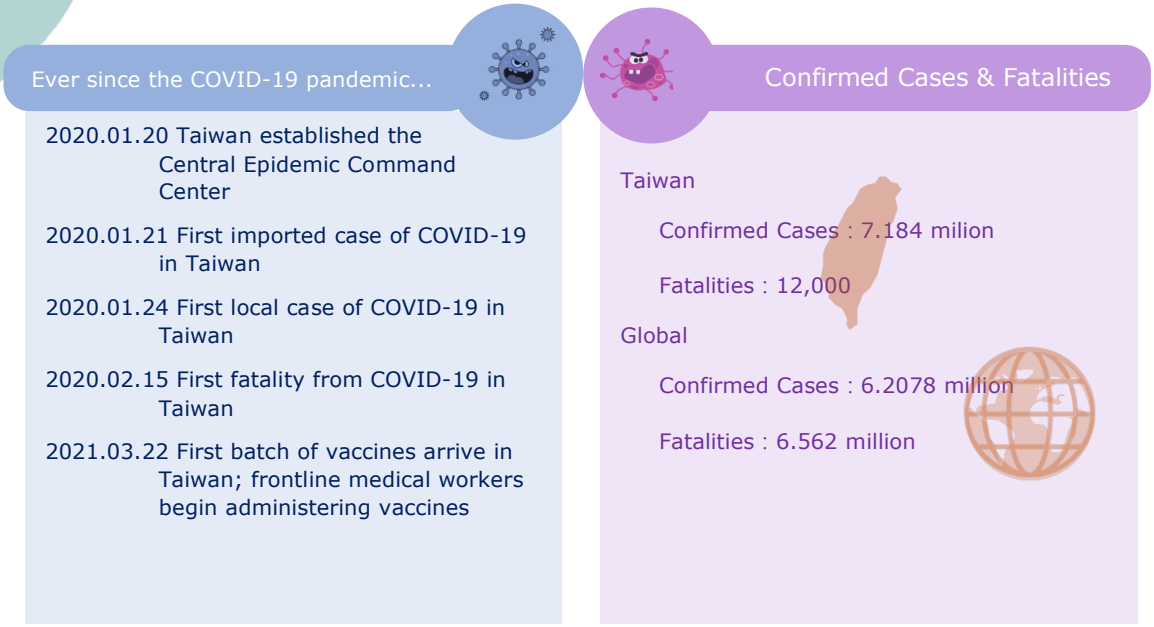
孰爲此者？天地。

天地尚不能久，而況於人乎？

《道德經》

# Chapter II Impact of Covid-19 on Education

In early December 2019, an unknown novel form of pneumonia emerged in Wuhan City of Hubei Province, China. On December 31, 2019, China reported 27 cases of pneumonia of unknown causes[24] in Wuhan to the World Health Organization (WHO), which was also the first time the world learned about this virus, later named COVID-19. Impacts of the COVID-19 pandemic on Taiwan as of June 30, 2022 can be found in table 2-1 below.




Source: *Taiwan Centers for Disease Control website*

Table 2-1 Overview of the COVID-19 Pandemic in Taiwan (2020.1.1~2022.10.16)

In 2020, COVID-19 spread rapidly throughout the world. The pandemic threatened the public's health, impacted our societies and economies, and became a large-scale stress test on education systems around the world. The most common measures implemented to prevent the spread of COVID-19 were social distancing and good hygiene practices, but these measures also heavily restricted student and teacher activities. To prevent the spread of COVID-19, countries around the world began implementing lockdown measures. Schools were forced to close down and billions of students stayed home as a result, posing an unprecedented challenge to our education systems.

*The State of the Global Education Crisis: A Path to Recovery*[25], a report jointly compiled by the World Bank, UNESCO, and UNICEF, pointed out that substantial losses in learning opportunities were documented in many countries. The report predicts that this

generation of students now risks losing $17 trillion in lifetime earnings in present value as a result of learning losses due to COVID-19, or the equivalent of 14 percent of today's global GDP. During the pandemic and school closures, children's health and safety were jeopardized, with domestic violence also increasing. The pandemic severely impacted student learning and exacerbated inequality in education. The global education crisis is, therefore, far worse than we imagined.

Since March 2020, most governments around the world have been implementing policies to suppress the spread of COVID-19. In early April, during the peak of school closures in Taiwan, over 1.6 billion students and 100 million teachers and school workers in over 190 countries were impacted. In 2020, countries (143 countries participated in the survey) reported 78 in-school instruction days lost at the pre-primary level, 78 days at the primary level, 79 days at the lower secondary level, and 80 days at the upper secondary level[26], which resulted in severe disruptions to student learning. Data show that, as of September 2021, around 8% and 19% of countries continue to face full and partial school closures, respectively, due to COVID-19[27]. Two years into the pandemic, school children worldwide have missed over 2 trillion hours and counting of in-person learning[28]. In the early days of the pandemic, Taiwan was largely successful in containing COVID-19, and schools were only closed on May 19, 2021 to comply with the rising epidemic alerts. School closures during this period lasted until the end of the semester. Yet, during the 2020 academic year, school closures at pre-primary, primary, and lower secondary levels still accounted for 16% of the total school year.

To prevent learning disruptions during school closures, countries implemented a variety of emergency response measures to mitigate the impact on students, families, and educators. Online platforms were widely used at all levels of education, and teachers, students, and administrators collectively and effectively learned how to utilize digital education. Students and teachers moved fast to adapt to remote learning, and digital resources became a lifeline for education. Nearly all countries rapidly increased digital learning opportunities for students and teachers and also encouraged new forms of teaching collaboration. COVID-19 disrupted learning around the world at an unprecedented scale and severity. But it also revealed the huge potential for education innovation and reforms to the education system.


Many countries had to ensure that schools were able to provide reliable and consistent services to students and parents during school closures and guarantee that schools maintained regular and dedicated contact with students. Some education systems built new communication channels to facilitate exchanges between students, parents, teachers, schools, and local authorities. Some countries even developed a series of measures to ensure the inclusivity of remote learning, including flexible digital platforms that enabled students to customize their progress and agreements with software developers and telecommunications service providers to strengthen the accessibility of online learning, especially at the primary level.

Even then, remote learning, a contingency measure, still introduced negative impacts such as screen fatigue, physical and emotional stress, and risks of students falling behind from lack of access to digital learning tools. As learning hours and spaces are restricted, schooling should prioritize course content to prevent overloading teachers and students, sometimes focusing more on reading, math, or other core subjects. In schools, teachers largely prioritized teaching new content rather than repeatedly practicing previous content. Teachers also focus more on prepping materials for remote learning, developing effective learning strategies, and inspiring social learning. Innovative AI technologies can help teachers understand the different ways that students learn to provide students with resources and a personal learning pathway that is compatible with their demands. Yet many teachers are still struggling to keep up with digitalization trends.

Digital learning yielded the worse learning outcomes in students from disadvantaged households. Students from low-income

households, students with disabilities, and girls had fewer opportunities to access digital learning compared to their peers. This was often due to a lack of electricity, connectivity, devices, quiet spaces to learn at home, caregiver support, discrimination, and gender inequality. In addition, the youngest students also had fewer opportunities to access digital learning compared to older students and were, therefore, more impacted by learning losses. This was especially prevalent at the pre-primary level, which is a critical stage for learning and development[29].

As such, 71% of countries surveyed by the OECD provided remedial measures to close the learning gap at the primary level, 64% of countries provided remedial measures at the lower secondary level, and 58% of countries provided remedial measures at the upper secondary level. In general, around half of the countries adopted concrete measures to help disadvantaged students and 30% of countries provided support to immigrants, refugees, minorities, and indigenous peoples[30].

The pandemic also complicated the management of national examinations and assessments. The dates, content, and methods of tests and assessments were changed to certain extents depending on the epidemic alert level and the importance of these tests. Countries that adopted diverse assessment models before the pandemic found it easier to use alternative methods in place of tests to evaluate progress in students.

Remote learning and the subsequent return to school both had profound and long-lasting impacts on the work of teachers. This crisis required many teachers to learn new skills and prepare materials for virtual learning. In some instances, this introduced new responsibilities to teachers. For example, teachers had to provide

support and resources to students, increase interactions with parents, provide remedial teaching, or carry out new administrative, health, and safety tasks implemented by the school. In some countries, new requirements on teachers urged governments to change the dispatch and hiring of educational staff.

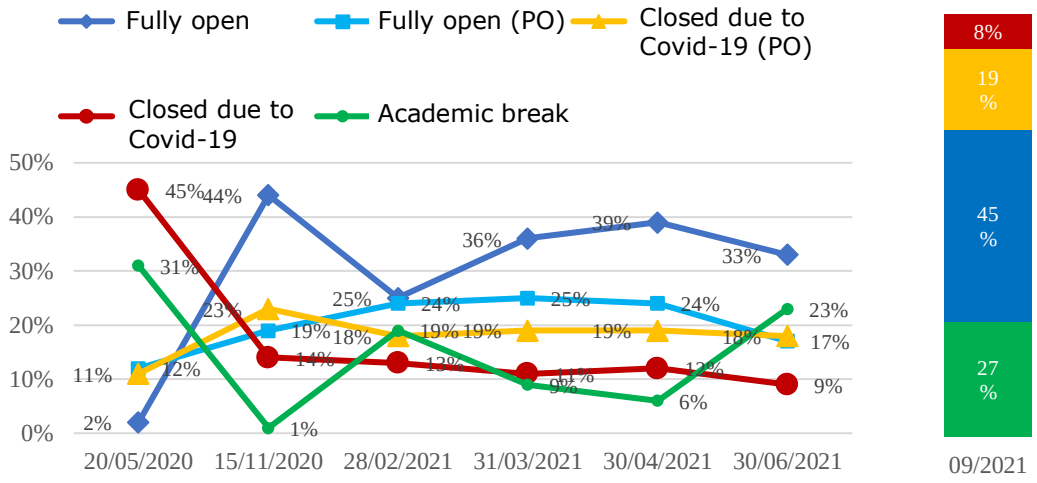
For teachers that are unfamiliar with online learning methods, the transitional time of online and hybrid teaching became especially challenging. Before the pandemic, teachers had much more limited professional development in ICTs when compared to other professionals and teachers were less likely to teach using the latest ICT products and services. As such, most countries provided a lot of online education opportunities to teachers during the pandemic, including ICT access and resources, professional ICT development for teachers, and enhanced digital competencies among teachers.

With the pandemic still raging on, COVID-19 continues to disrupt education in 2022. Education systems around the world are still working hard to ensure learning continuity. On one hand, disrupted learning may lead to long-term trauma in students in terms of life-long economic and social welfare. As such, it is incredibly important to learn the right lessons from our experiences during this crisis. On the other hand, the crisis has revealed the huge potential for innovation that lies hidden in many education systems, meaning that encouraging internal innovation in education systems and encouraging them to remain open to innovation introduced by outside parties are both critical.

In the section below, we will explore three education dimensions that were impacted by COVID-19: "School Closures & Remote Learning," "Impact on Learning Outcomes," and "Support for Secondary & Primary Teachers."

# Section I School Closures & Remote Learning

The COVID-19 pandemic disrupted traditional schooling and led to full or partial school closures in many countries around the world. In many countries, including Taiwan, criteria for school closures were set by the central government. The criteria and duration for school closures were different around the world, but in all countries, any classes that had a student diagnosed with COVID-19 would be suspended. During school closures, governments around the world worked hard to support learning continuity, yet problems exist with the learning opportunities, accessibility, and quality of alternative teaching methods. Fortunately, after 2021, school closures were not as prominent around the world. With vaccination rates on the rise, the percentage of school-wide closures also decreased significantly (figure 2-1). UNESCO has continued to monitor school closures and alternative teaching methods since the beginning of the COVID-19 pandemic. Data show that, as of September 2021, around 8% and 19% of countries continue to face full and partial school closures, respectively, due to COVID-19[31].




Note：1. Fully open (PO): Students in the regions and/or in the levels of education under open school modality in partially open countries; Closed due to COVID-19 (PO): Students in the regions and/or in the levels of education under closed school modality in a partially open country. 2. Source of the left chart：*UNESCO*。3. Source of the right chart：*UNICEF*

Figure 2-1 Share of School Closures

## Duration of school closure shorter in Taiwan compared to rest of world

During the early days of the pandemic, Taiwan was very proactive in epidemic prevention and contact tracing. Most confirmed cases were imported and only a few classes or schools were forced to close due to quarantine measures. Unfortunately, COVID-19 vaccines and medication were not yet available. In addition, schools have a lot of students and are generally a space that is prone to cluster infections. As such, the Ministry of Education decided in March 2020 to delay the start of the spring semester by two weeks, until the end of February. The Ministry of Education also announced epidemic prevention measures and school closure criteria.

In the early summer of 2021, the pandemic in Taiwan spread rapidly. During that time, vaccination was not yet prevalent in Taiwan and so the Ministry of Education announced full school closures in May, asking schools to provide remote learning to ensure that students could continue to learn at home. Not including weekends and national holidays, Taiwan's school systems were closed for 32 days or the equivalent of 16% of total teaching days during that academic year.

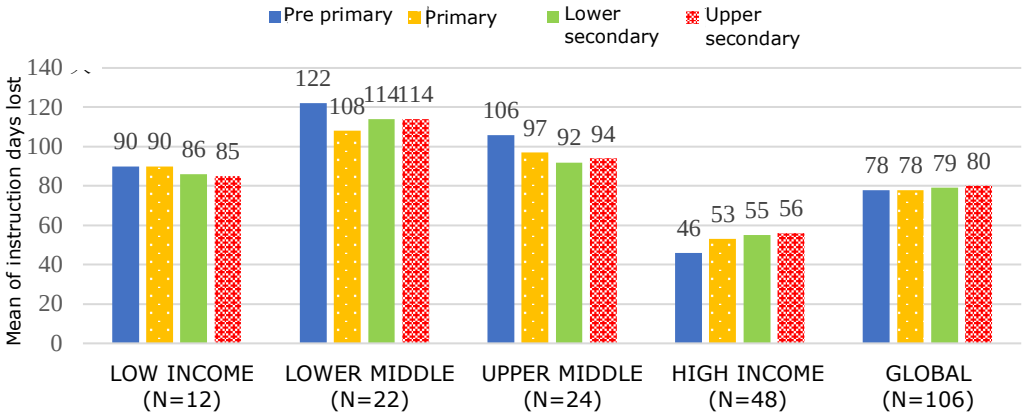
Entering the next semester, students returned to school in person, but some schools and teachers had to adopt hybrid learning, integrating online and in-person teaching, in response to classes being forced out of schools due to COVID-19 cases. In May 2022, schools in Taiwan were fully closed again due to the Omicron variant. As government policies became directed toward coexisting with the virus, the Ministry of Education amended school closure criteria and only some countries and cities closed schools until the end of the semester. School closures and make-up days due to COVID-19 at the pre-primary, primary, and lower secondary levels in Taiwan can be found in table 2-2 below.

| Full Closure | Partial Closure | Make-up Criteria |
| --- | --- | --- |
| First day of school delayed from 2020.2.11 to 2020.2.25 (Spring semester of the 2019 academic year changed to 2020.2.25-2020.7.14).<br>On 2021.5.19, all schools in Taiwan were closed until 2021.7.2.<br>On 2022.5.8, all counties and cities began implementing flexible school closures. | On 2020.02.19 Ministry of Education announces : Classes with 1 confirmed teacher/ student case will be closed for 14 days. Schools with 2 or more confirmed teacher/ student cases within 14 days will be closed for 14 days. Countries, towns, and cities with 1/3 of schools closed will close all schools in the county, town, and city for 14 days.<br>From 2022.03.03~05.28, the Ministry of Education continued to amend the Implementation Guidelines for School Closures, shortening the suspension period to 10 days, and developing standards for adjusting teaching methods. | Classes that were closed should make-up lost days at school, during break time or holidays.<br>Flexible school days: Schools experiencing full closures can apply to the Committee of School Curriculum De velopment to adjust school days, distributing make-up days across weekends or making up the days during winter or summer breaks.<br>From 2021.5.19 to 2021.5.28, the Ministry of Education announced between: School at all levels will adopt online learning. Students shall learn remotely at home and will not be going to schools. Online classes will be considered as formal classes and make-up days will not be required during summer breaks.<br>On 2022.5.8, schools were fully closed. |

Table 2-2 School Closures & Make-up Days Due to COVID-19 at the Pre-primary, Primary, and Lower Secondary Levels in Taiwan

Taiwan adopted a proactive approach to contain the pandemic, yet many countries around the world were unable to prevent the virus from entering in the first days of the global pandemic. As a result, countries around the world started reporting large numbers of COVID-19 cases. In 2020, the worse COVID-19 year, schools around

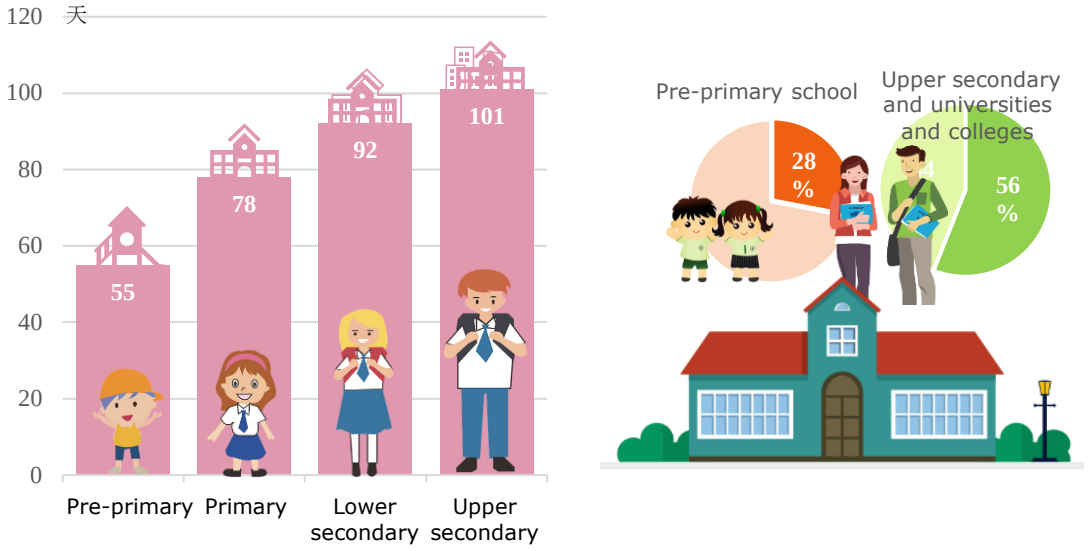
the world were closed for an average of 79 days or the equivalent of 40% of total teaching days in the academic year at all four levels (excluding weekends and holidays). We must also note that there was a significant difference in the duration of school closures between countries of varying income levels. School closures lasted an average of 53 days in high-income countries, 97 days in middle-income countries, 115 days in low- and middle-income countries, and 88 days in low-income countries (effective sample size was 106 countries)[32]. Please see figure 2-2 below.




Source : *OECD iLibrary,What's Next? Lessons on Education Recovery*

Figure 2-2 Comparison of Average School Closure Duration in Countries with Different Income Levels

*The State of Global Education: 18 Months into the Pandemic*, a special report published by OECD, shows that the majority of countries lost many teaching hours due to school closures during the first 18 months of the pandemic. All 30 countries/ regions surveyed by OECD closed at least all schools at one education level between January 2020 and May 2021. School closure duration rises with education levels. In other words, universities and colleges were closed for more days than other education levels. Quite a few European countries recognized that self-directed learning would be difficult for the youngest children and made it harder to fully close pre-primary and primary schools later on. On average, between 2020.1.1 and 2021.5.20, pre-primary schools were fully closed for 55 days, primary schools for 78 days, lower secondary schools for 91 days, and upper secondary schools for 101 days (excluding weekends and holidays). This was the equivalent of 28% of annual school days for pre-primary schools and 56% for upper secondary and universities and colleges (figure 2-3)[33].




Source: : *The State of Global Education: 18 Months into the Pandemic*

Figure 2-3 Average School Closures During the Pandemic - Taiwan & Other Countries

UNESCO monitored the first two years of the pandemic and found that schools around the world fully closed for an average of 20 weeks and partially closed for an average of 21 weeks. Around 1 out of ten countries experienced full school closures for 40 weeks. Since the start of the pandemic and in subsequent lockdowns, children worldwide have missed over 2 trillion hours and counting of in-person learning[34].

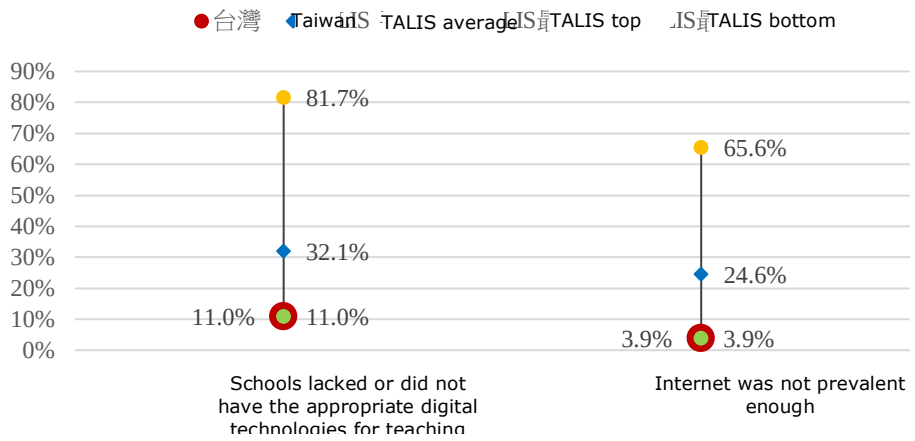
## 2 Learning During School Closures in Taiwan

During the pandemic, classes with 1 confirmed teacher/ student case were closed for 14 days. In this unexpected crisis, an important challenge for schools ensuring learning continuity was how to provide effective remote learning. Digitalized remote learning became an opportunity to provide high-quality learning opportunities to learners and became the preferred alternative during school closures.

Digital learning systems could be used to teach students but also as powerful tools to assist with learning. These systems can observe how students learn, tasks and thinking modes students are interested in, and problems they find boring or challenging with far more details

and accuracy than any traditional classroom environment. This enables teachers to adjust their content to adapt to students' personal learning styles and provide students with opportunities to design, execute, and learn rather than simple rote memorization. Digital technology provides answers to what students are learning, how they are learning, where they are learning, and when they are learning. If we can capitalize on digital technologies, the roles and functions of teachers can transcend from simply passing down knowledge and solving problems to co-creators, coaches, instructors, and evaluators of knowledge. As such, during school closures, digital resources suddenly became a lifeline for education.

Yet, are schools and teachers in Taiwan ready for digital learning? Surveys before the COVID-19 pandemic indicate that principals in Taiwan did not believe that schools were fully prepared but had a solid foundation for digital learning. According to the 2018 PISA report by OECD, only a small percentage of principals in Taiwan expressed that schools lacked or did not have the appropriate digital technologies for teaching and that internet was not prevalent enough, which hindered schools' abilities to provide quality education[35] as shown in Figure2-4 below.

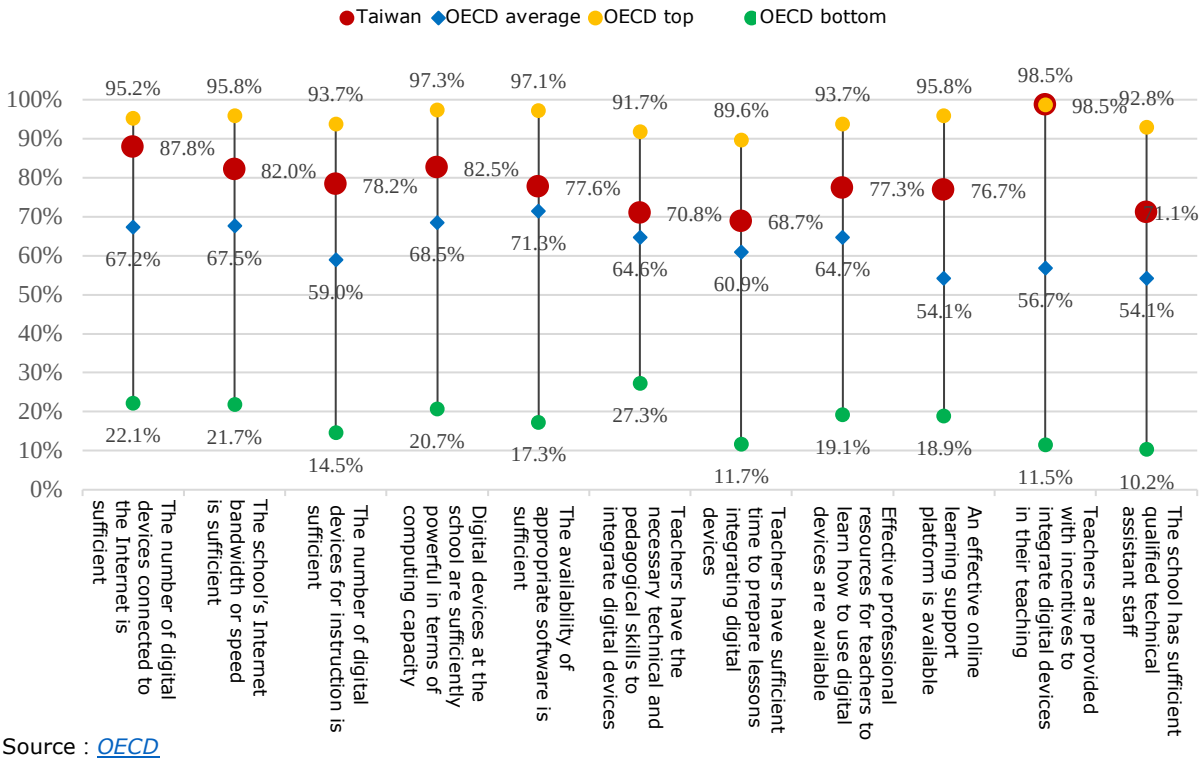



Source : *OECD,TALIS 2018 Results (Volume I)*

Figure 2-4 Percentage of Taiwan Schools at all Levels Using Digital Equipment to Strengthen Teaching & Learning Competencies

The *PISA 2018 Results* by OECD also show that digital equipment in Taiwan schools for 15-year-old students is not 100% sufficient, but already exceeds many other countries. Principals stated that schools are unable to ensure that every student has access to computers and the average ratio of computers to students was 0.6. Around 76% of

students attended a school where an effective online learning platform is available to them; around 70% of students attended a school where teachers were equipped with the necessary skills and education skills to integrate digital equipment into their teaching (figure 2-5)[36]. It is worth nothing that software, hardware, and teachers' digital teaching competencies in remote schools were less sufficient than in schools in urban areas[37].




Source : *OECD*

Figure 2-5 Percentage of Taiwan Schools Where Teachers Use Digital Equipment to Strengthen Teaching & Learning Competencies

During the COVID-19 pandemic, despite education systems in Taiwan not being fully prepared, the Ministry of Education launched a variety of measures to provide strong support to schools and prepare them for remote education to ensure learning continuity for students as part of a government initiative to support learning during school closures. The COVID-19 crisis urged education systems in Taiwan to set up a centralized response team to coordinate efforts, formulate instructive guidelines, and establish cooperation mechanisms across agencies to galvanize public and private resources. This also urged education systems in Taiwan to spotlight learning environments at home, education equity and inclusivity, and strengthen support for disadvantaged students.

## Instructions & Drills for Online Learning

In February 2020, all schools in Taiwan delayed the first day of school by two weeks. Before the first day of school, the Ministry of Education announced guidelines for school closures and make-up days and the Online Education & Learning Guideline, calling on the Ministry of Education, city governments, and county governments to set up a central response team that can help schools prepare for online learning.

The Ministry of Education required all schools or classes closed due to COVID-19 to make up classes either online or in-person. Teachers could use online learning platforms to provide daily learning plans and self-directed learning materials to students or make up classes during break times, holidays, winter breaks, or summer breaks. Schools that opted to make up classes with online teaching were required to plan out and prepare an online learning plan beforehand to ensure quality.

In addition, the Ministry of Education produced education videos and rolled out online learning drills to familiarize teachers with online teaching. The Ministry then collected information from the drills to resolve any problems and improve their measures. The Ministry of Education invited teachers with online teaching experiences to film videos, introduce the basic concepts of online teaching by different topics, and demonstrate how different tools can be used for synchronous online teaching and hybrid teaching so that teachers, administrators, and education managers at all education levels have a greater understanding of the significance and practices of online teaching. Later on, the Ministry promoted small-scale, short-term, and partial changes to teaching methods in universities and colleges to implement and practice remote learning. Local governments were responsible for planning and organizing remote learning at primary and secondary levels; and schools making up classes online were required to organize one remote learning practice run for each class beforehand[38].

## Digital Learning Resources & Platform Services

To make online learning more convenient, the Ministry of Education integrated multiple public and private online learning platforms and grouped digital learning resources and services onto a single web portal - Edu Cloud, which was free to all teachers and students in Taiwan. The Ministry of Education also provided digital

platforms, materials, and tools required by schools for online teaching or make-up classes. Students and teachers could utilize videoconferencing applications developed by Microsoft, Cisco, and other corporations for synchronous remote teaching. Primary and secondary teachers could log onto online learning platforms (e.g., Adaptive Learning website, CooC Cloud, Junyi Academy, LearnMode, etc.) to prep classes based on student progress or learning needs, point students to the appropriate courses, learning content, and homework, or engage in online discussions. College and university students could engage in self-directed learning by enrolling in courses available on OpenCourseWare platforms (e.g., MOOCs platforms, Taiwan Open Course and Education Consortium, General Education TW, etc.).

## ICT Equipment Support

The Ministry of Education lent information equipment required for online learning to teachers and students for free and, during school closures, free internet access to disadvantaged students. In March 2020, the Ministry of Education announced the Notices for Secondary, Primary, and Pre-primary Schools Borrowing Information Equipment for Online Learning and allocated an emergency fund to purchase laptops, tablets, and routers. Disadvantaged students learning from home were prioritized over other students when lending out equipment. During the same time, the Ministry of Education also coordinated local telecommunication service providers to offer discount internet plans to regular students (not economically disadvantaged students). During school closures, students from disadvantaged households received free prepaid cards that provided internet access.

## Accelerating the Digitalization of Learning

In November 2021, the Ministry of Education set forth the "Program to Advance Digital Learning at Primary & Secondary Levels," announcing that the Ministry will be investing more funds to accelerate the roll-out of digital learning and ensure that all classes have access to the internet and all students have access to tablets. The program includes 3 projects: "Augment Digital Content," "Enhance Mobile Devices & Internet Access," and "Big Data Analysis for Education" in the hopes that the program can achieve the 5 major goals of "Engaging Materials," "Lighter Backpacks," "Diverse

Education," "Effective Learning," and "Balance between Urban & Rural Areas."

Taiwan has a robust tech industry and ICT is among our nation's strengths, meaning that Taiwan has a unique advantage that can accelerate solutions for shortages in remote learning resources, technologies, and equipment. This enabled Taiwan to launch remote learning and online learning as soon as schools were closed. Long before the COVID-19 pandemic, the government had already been investing in information equipment within schools, supporting digital learning environment demands from teachers, and working on promoting auxiliary digital learning programs. The COVID-19 crisis urged Taiwan's education system to shift its focus to support economically disadvantaged and multi-children families. First ensuring that all students have access to the internet and online learning materials before enhancing various platforms with digital learning content. Various education technology solutions that maintain communication, ensure open learning spaces, and attract student interest seem to be the best approach to minimize the massive learning losses incurred during the crisis.

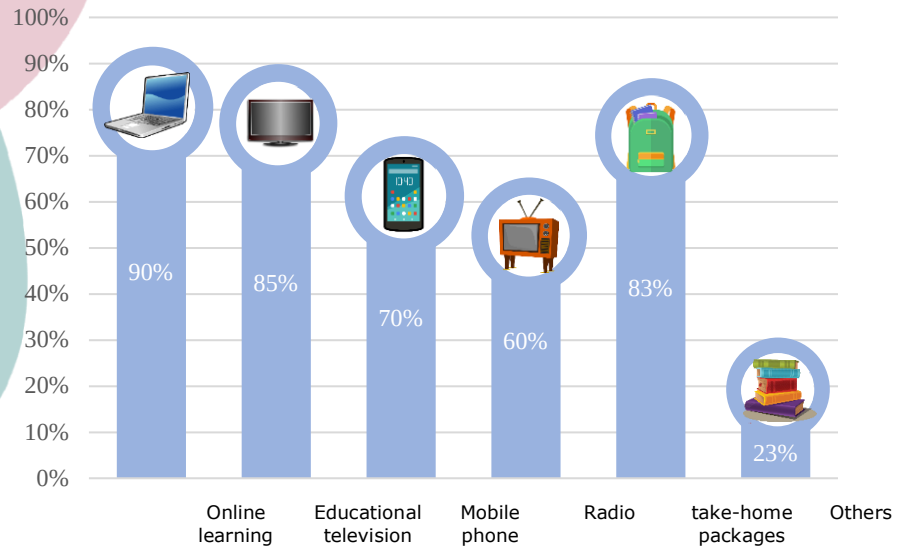


## Remote Education across Countries

Impacted by the COVID-19 pandemic, governments chose to close schools to contain the pandemic, but remote education became a challenging test for schools, teachers, and students. Education systems and teachers around the world have made great strides during this crisis, providing hardware equipment and software equipment as well as utilizing digital technology to teach. Other efforts made by education systems include accelerating the digitalization of education, adjusting courses, innovative online learning modes, closing the digital gap in education, and strengthening teacher training. As countries attempted to minimize learning losses, a tough challenge, the drastic differences between and within countries were also exposed.

To make up for learning losses from school closures, many countries adopted digital technology after the pandemic as a form of auxiliary and innovative learning. But also, looking at the equipment and resources at schools before the pandemic, we can see that most schools were not prepared. *PISA 2018 Results* show: on average across OECD countries in 2018, there was almost one computer available at school for every 15-year-old student (computer-student ratio equal to 0.8). Yet many principals reported that the computing capacities of these computers were outdated and that their schools lacked a powerful online learning platform. On average, only around 54% of students attended a school where an effective online learning platform is available to them. Yet, in countries like Argentina, Costa Rica, and Kosovo, the percentage was less than 30%, indicating that there was a significant difference between high-income and lower-income countries. More importantly, many teachers were not prepared for the digitalization of education. In OECD countries, only 65% of students attended a school where teachers had the capacity to integrate digital equipment into their practices[39].

With school closures often implemented at short notice to respond to the rapidly changing situations, schools were forced to adapt and urge teachers and students to rapidly adapt to remote education. During these situations, many countries leveraged existing digital equipment as a foundation for them to develop new digital tools that can help them respond to rapidly changing landscapes. Data shows that online learning (91%) was the first choice of many countries during the lockdown, followed by educational television (85%) and take-home packages (82%). Support through mobile phones (70%) and radio (54%) were not as common, and how the different learning modes were implemented varied drastically across and within countries[40] (figure 2-6). The pandemic also unexpectedly led to many countries developing hybrid learning opportunities.




Source : *UNICEF(2021)*

Figure 2-6 Share of Online Learning Models Used Around the World

## Thoughts on Education

Remote education often refers to one or multiple technologies that enable teachers to teach and instruct students at another location. Remote education also supports synchronous, asynchronous, regular, and real interactions between students and teachers. Technologies applied to education may include paper-based materials (e.g., books & take-home packages); television; radio; the internet; and one-directional or bi-directional transmissions through various media, e.g., radio, CCTV, cable television, microwaves, broadband network, optical fiber, satellites, or wireless communication devices; conference calls; and video tapes and optical discs (DVD & CD-ROM).

During this education crisis, countries tried to develop a series of tools to provide remote education to students. For example, various departments (education, culture, and science) in the Netherlands worked with a number of private education institutes to develop online learning platforms, integrating industry and government forces to provide quality education resources during the pandemic. The U.K. Department of Education actively worked with mobile network operators to train online lecturers, providing free online teaching training to school teachers, offering free and additional mobile network access to disadvantaged students, and lending out 4G

routers. Vietnam mobilized teachers around the country to design and record television lessons that were then broadcasted on TV to help students that are prepping for entrance exams. In Libya, schools sent out printed education materials and information packages to parents for students to take home as part of their remote education efforts. In India, over 60% of households in villages own smartphones and so students were able to use WhatsApp for learning. To better support remote areas and ensure a more even distribution of educational resources, India also launched diverse learning channels, providing lessons through TV programs, the radio, and WhatsApp. India also set up chatbots to help teachers answer questions from students for education assessment and instructions[41]. According to UNESCO data, countries with higher income levels leaned more heavily on online learning platforms, while countries with lower income levels relied more on radio or television.


While low-income and high-income countries used different remote education models, over 50% of the countries used over five different remote education models, including synchronous online learning (i.e. real-time with interaction such as Zoom/Skype classes) and hybrid learning (i.e. learning through online channels without real-time interaction with other students or teachers, at one's own pace)[42]. Korea incorporated different types of remote learning, including two-way live courses (synchronous learning), content-based courses, homework-based courses, and courses combining two or more of these methods. In France, online platforms often operated in two different but complementary and articulated ways: at the national level, the National Centre for Distance Learning (Centre national d'enseignement à distance, CNED) provided access to

educational resources and virtual classes, while at the local level, other platforms were also used. In Luxembourg, synchronous learning took place to a varied extent and was adapted to the age of children. There were also a number of tutorials, teaching videos and other online learning materials, as well as training courses for teachers on how to develop such asynchronous learning offers[43].

Countries were able to provide remote education to students during school closures, and so 74% of students reported that learning continuity was maintained. Though some countries were unable to provide remote education to students immediately upon school closures, they later strived to increase education coverage as well[44]. Countries developing hybrid learning opportunities was an unexpected outcome of the pandemic (i.e. integrating online materials and online interaction opportunities with traditional in-person classes). But these are all early attempts that depended greatly on how proactive teachers were. Though remote education was largely common, many countries recognized that remote education strategies did not compensate for each day of in-person teaching lost during school closures.

Remote education during the pandemic can help mitigate the impact of school closures on learning. Most countries were able to implement contingency policies during school closures, increasing the inclusivity and effectiveness or remote education and resolving challenges faced by students. Yet remote education opportunities alone cannot increase student participation and acceptance. Maladaptation to remote education, poor internet connection, fewer teaching hours, and lack of required digital literacy in students and teachers will all impact the conversion of learning outcomes.

During the same time, children across countries were also experiencing unequal distribution of opportunities to access remote learning. School closures disproportionately affected disadvantaged students. They are less likely to receive quality education and unlikely to benefit from digital learning facilities, quiet learning spaces, and supportive environments for effective remote learning. Over a third of lower-middle-income countries that provided remoted education through TV or radio reported that less than half of students were reached[45]. The pandemic has led to students and teachers relying more heavily on digital equipment and self-directed learning. Advantaged students with more equipment can access diverse learning platforms and a wealth of online learning resources, while disadvantaged students lacking equipment can only access low-quality learning environments and may not even have access to remote education. The model of remote learning has thus given rise

to a paradox: it expands education inequality through existing digital gaps but also helps shift society's spotlight to education equality, from the distribution of resources such as teachers and funding to the threat of the digital divide.

Interviews with teachers, students, and parents show that they have different experiences with remote education, for example:

- Students:

  "After logging on and getting into the digital classroom, I can only see the teacher's face but there's no sound at all. The teacher was like a mime artist!"

  "When the classes online are boring, I put my phone up against my laptop screen so I can play games while pretending I'm still looking at the teacher."

  "I really want to go back to school because when I'm taking lessons online, my mom is always watching me and it's very stressful. She's anxious about me not understanding and I'm anxious about her staring at me."

  "Sometimes I'm just staring at the screen the whole day. I really want to talk to someone, but I don't know who I can reach out to?"

- Parents:

  "My husband and I both have to work. Obviously, we're worried about our child being home alone for school, but we don't really have a choice."

  "I'm not really great with computers or electronics so I don't help my kid with uploading homework or dealing with the internet."

  "During the pandemic, companies are already short-staffed and so taking time off would have a really big impact and put more burden on our co-workers. We had to train our son to take lessons from home and then take turns taking lunchtime off to bring him lunch and see how he's doing. We felt really bad but we just had to see it as an opportunity to train him how to be independent."

  "My son's reading disorder returned. He's nine now. After struggling through a passage, he begins blinking in pain and confusion. Before the pandemic, he was already able to speak in full sentences and write a little. Even with me and the teacher

doing everything we can to help him, he's only able to read a few words now."

- Teachers:

  "We started remote education on May 19 and, ever since then, we've had students skipping classes. The online dropout situation started on May 19."

  "Teaching P.E. online just doesn't feel the same as in-person instructions. I can only demonstrate in front of a camera and I have limited space to move under. We can't hold any real games either."

  "Whenever students turn on their mics to speak, we can hear their brothers or sisters in the same room taking online classes as well. With that interference, we can't really hear what our students are saying."

  "A lot of students with special education needs rely on routines and rituals in their daily lives for security. With the pandemic, their routines of going to school and going home have been disrupted. It's really hard for them to learn normally through online education."

- Ministry of Education:

  "Considering learning outcomes and the emotional/ physical development of students, schools are recommended to cut online lesson times by 50% of the actual classes (around 20 to 25 minutes)."

## Section II  Impact on Learning Outcomes

The COVID-19 pandemic created the largest education crisis in history. To contain the pandemic, most countries chose to close down schools and institutes of higher education. The decision had immense and costly consequences as disruptions in education have a significant impact on student learning. Though nearly all countries provided remote education to students and explored new teaching modalities and opportunities for self-directed learning, education systems varied drastically in their ability to react to this crisis, delivering varying levels of remote education and support to children. The quality and scope of impact of related measures were also unevenly distributed. Remote education, as a contingency, is a partial replacement for in-person instruction at best.

Schools were sometimes partially closed, fully closed, or reopened. As such face-to-face schooling was often paired with remote education and students and teachers had to alternate between the two learning modalities. Differences in the quality, diversity, accessibility, and continuity of online learning materials further disrupted the daily lives and learning of students. These situations led people to question education outcomes and the schooling that students are missing out on from the pandemic[46], especially for younger and more vulnerable students because they usually miss out on more and face higher risks of abuse, neglect, and other physical and emotional health issues[47]. The safety, protection, emotional and social support, and lunches provided by schools are effectively brought to a halt due to school closures. School closures also impact transitions between different levels of education. For example, students diagnosed with COVID-19 or under quarantine are no longer able to attend college entrance. Tests bridging students from higher education to the job market are also forcibly interrupted. The crisis exacerbated existing education inequalities in many ways.


We have yet to fully understand the severity of COVID-19's impact on learning outcomes, but the gradually emerging evidence is creating profound concerns. A growing number of papers are painting a heart-wrenching portrait of the impact of school closures on children learning and well-being: the learning losses are substantial and unequal. These learning losses may impact the educational trajectory and human capital accumulation of students, because the losses in learning may limit students' ability to receive higher levels of education, employment opportunities, and long-term future earnings. Estimations have shown that school closures may result in

trillions in USD of future earnings for the current cohort of students and lower economic growth globally that will be the equivalent of 0.8% less each year[48]. As such, it is critical to spotlight learning recovery and education equality as students are returning to school.

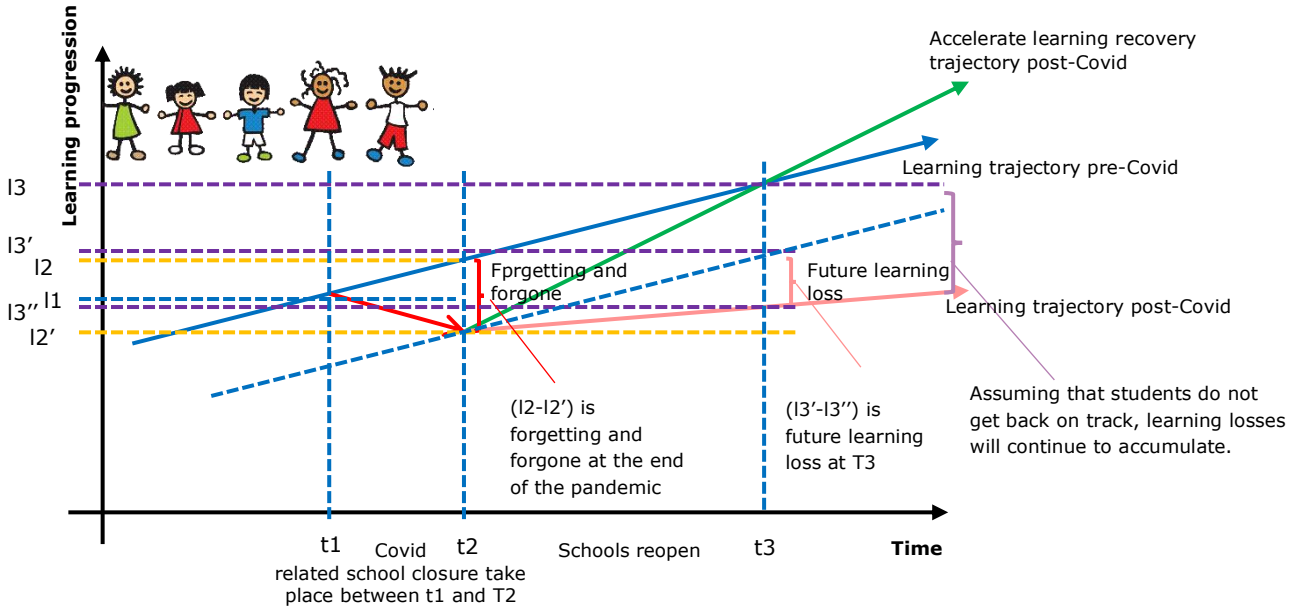
## Short-term school closure may cause long-term losses

To children, schools are the primary sources of knowledge and learning opportunities. School closures will impact the knowledge and skills acquired by students during their growing years and lead to learning losses in the student's life. These losses may translate into even larger long-term impacts, limiting students' job opportunities and earning potential years after they graduate[49]. Throughout this education crisis, Taiwan experienced shorter school closures than most other countries, but even short-term school closures can have a major and long-term impact on student learning.

Learning loss is a term often used in literature to describe the decrease in student knowledge and skills. Learning losses are most commonly due to education gaps or discontinuities in education, such as reduced learning efficiency or other impacts from disruptions to formal education from summer breaks, dropping out of school, skipping classes, etc. During the COVID-19 pandemic, education systems varied in their ability to provide support to combat the crisis. Remote education can hardly be a perfect substitute for face-to-face learning and makes hands-on lessons especially difficult, particularly for young children, children from disadvantaged households, and disabled children. School closures also change the effects of peer learning. Schools bring together children from different socio-economic backgrounds, but when schools are closed, such impacts are also gone. Another important factor is reaction from parents; some children are able to compensate for changes in their learning environment by themselves but some children find it harder to adapt. As these problems begin to emerge, education researchers have started to analyze the impact of school closures on learning losses. We are witnessing new research on the actual impacts of COVID-19 on learning progress as well.

The World Bank, UNESCO, and UNICEF jointly compiled *The State of the Global Education Crisis: A Path to Recovery*[50] to detail the impact of the COVID-19 pandemic on learning. The report defines the term "learning loss" as any loss of knowledge or skills and/ or deceleration of or interruption to academic progress, most commonly due to extended gaps or discontinuities in a student's education.

There are generally two main types of learning losses: "forgetting" and "forgone" learning. "Forgetting" refers to the loss of previously acquired learning, and "forgone" learning means expected learning that does not take place as schools are closed to in-person learning. On top of forgetting and forgone learning, additional learning losses could accumulate even after students return to school. Figure 2-6 illustrates that if children lost essential building blocks for future learning during school closures and are not helped to recover, learning will continue at a slower pace than before. Simulations from the World Bank predict that this generation of students now risks losing $17 trillion in lifetime earnings in present value as a result of school closures from COVID-19, or the equivalent of 14% of today's global GDP[51].




Source : *The World Bank, UNESCO and UNICEF (2021). The State of the Global Education Crisis: A Path to Recovery.*

Note : Figure 1 illustrates the elements described above using a hypothetical learning progression (slope) given by the learning trajectory pre-COVID. It shows that COVID- related school closures between period t1 and t2 can yield learning losses (both in terms of forgetting and forgone). Such losses can be measured at t2 (present time) as schools reopen. Since learning is progressive, if it is not recovered, students might be pushed towards a new learning trajectory (post-COVID learning trajectory) with a flatter slope, which will result in a level of learning at t3 that would be lower than would have been expected if students had remained at the pre-COVID rate of learning. This difference is referred to in the figure as future learning losses. The current crisis presents an opportunity, since to recover learning losses, students must be put on an accelerated learning recovery trajectory. This rate of learning can bring students back to the expected pre-pandemic learning levels at t3,

and change the future expected learning levels of this generation beyond t3.

Figure 2-7 Learning Trajectories Before & After COVID-19

Learning is a cumulative process, with new skills building on existing ones. Past research has proven that affected cohorts of children end up with lower educational attainment, as well as lower earnings and higher unemployment in adulthood[52]. Some evidence shows that part of the substantial, continuous, and unequal impacts on learning from school closures are attributable to slower learning once children return to school. If children lost essential building blocks for future learning during school closures and are not helped to recover with remediation measures, learning will continue at a slower pace than before, pushing children to a less efficient learning trajectory. Consequently, learning losses associated with the COVID-19 pandemic may result in compounded negative consequences for this generation of students by harming children's future learning trajectories.

The World Bank recently published a comprehensive report analyzing the evidence of learning losses from school closures between March 2020 and March 2022. The report consists of 35 robust studies representing data from 20 countries to further prove that learning losses from COVID-19 are real and substantial. Studies found that learning losses ranged between 0.25 and 0.12 standard deviation (average was 0.17 standard deviation), equivalent to roughly a one-half years' worth of learning. Greater learning losses were found among students or schools with lower socio-economic status and students at lower levels of academic achievement. The longer the schools remained closed, the greater the learning losses. On average, for every week that schools were closed, learning declined by 1.2 points, or 0.01 standard deviation, on average. Nevertheless, the report also looked at more optimistic studies at the end, showing that some countries have been attempting to remediate learning losses and warned that inequality in learning across more advantaged and disadvantaged groups is likely going to grow over time (table 2-6)[53].

**Findings from countries using descriptive statistics to document learning losses:**

- In Bangladesh, adolescent girls' literacy and math scores declined by over 6% (Amin et al 2021).
- In India, the percentage of third-graders in public schools who can perform simple subtraction decreased from 24% in 2018 to only 16% in 2020, and the percentage who can read a second-grade text decreased from 19% in 2018 to 10% in 2020 (ASER 2021a).
- In Pakistan, the percentage of first- to fifth-graders who can read a story declined from 24% in 2019 to 22% in 2021 (ASER 2021b).
- In Uganda, the percentage of learners proficient in English and math in 2021 dropped by 5% and 13% from that of 2018 (NAPE 2021).
- In Canada, the reading assessment scores of second-graders and third-graders declined by 4 to 5 points (Georgiou 2021).
- In Korea, there was a significant decrease in scores in medical school students (Kim et al. 2021).

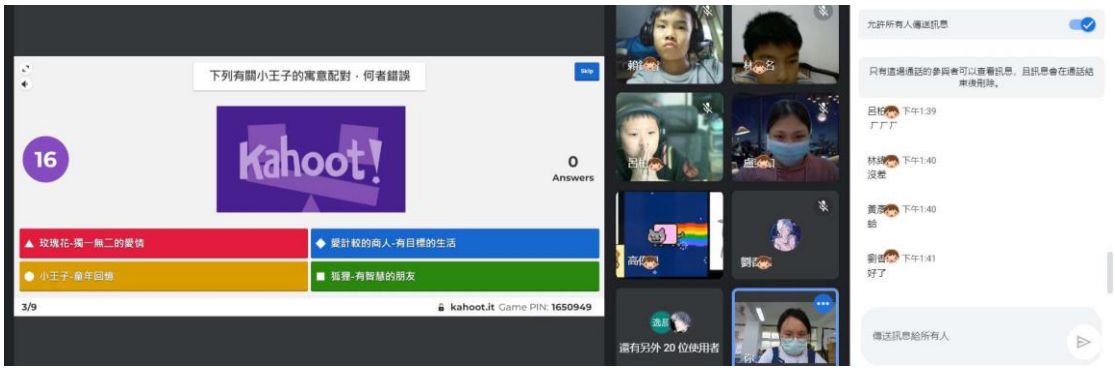
## Optimistic research findings:

- In Nara City, Japan, math achievement scores had increased six months after COVID-related school closures. While the initial closures had brought down scores, responsive policies largely overcame this decline (Asakawa and Ohtake 2021). During the school closures, students watched virtual lessons streamed by their teachers, carried out independent work, and submitted paperwork for revision by their teachers. Nara City also decreased its summer vacation in response to the school closures, from 34 days to 16 days. Although a broadly successful response, the school closures impacted lower-income students significantly more, and these students also showed slower growth than their peers upon returning to school.
- In the U.K., the Educational Policy Institute found learning loss declined substantially after schools reopened. In autumn 2020, students were found to be behind by an average of 3.6 months in mathematics, but by the summer of 2021, the loss had decreased to an average of 2.2 months.
- In France, learning loss evidence is mixed, with on average very low levels of learning loss experienced thus far, though there are still equity effects with more disadvantaged students suffering more (Thorn and Vincent-Lancrin 2021).
- In Denmark, there were no evident learning losses and no equity effect (Birkelund and Karlson 2021). It seems that Danish children received good home support and their reading behavior increased significantly because of school lockdowns (Reimer et al 2021).
- In Sweden, where primary schools did not close during the pandemic, there were no reported learning losses (Falth et al 2021).
- In the state of New South Wales, Australia, there were no significant differences between 2019 and 2020 in student achievement growth; however, learning did decrease in the least advantaged schools (Gore et al 2021).

Source：Patrinos, H.A., Vegas, E., & Carter-Rau, R. (2022). An analysis of COVID-19 student learning loss. Policy Research Working Paper, 10033. World Bank Group, Washington, DC.

## 2 Changes to the content, format, and administration of learning assessments and examinations

Under the COVID-19 pandemic, the world adjusted course content and teaching strategies. Learning assessments and examinations at all levels experienced changes as well. The purpose of learning assessments is to understand students' level of comprehension, understanding, and acquisition of skills by collecting information. The pandemic resulted in many schools adjusting the percentage of formative assessments and summative assessments. During the pandemic, it became difficult for many schools to carry out scheduled evaluations (e.g., pen & paper tests) and so schools adopted more diverse assessment methods, replacing previous assessments with homework, written reports, works, projects, performance evaluations, and online evaluations.

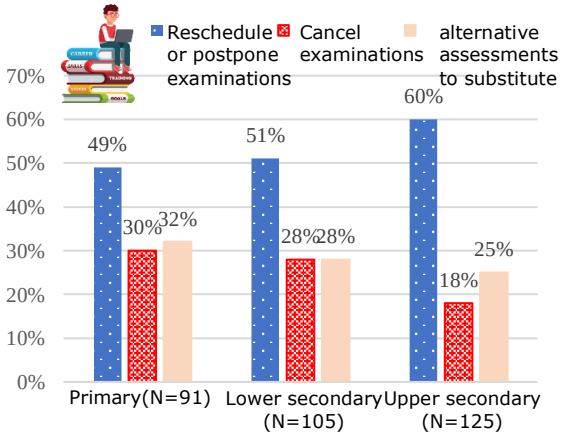


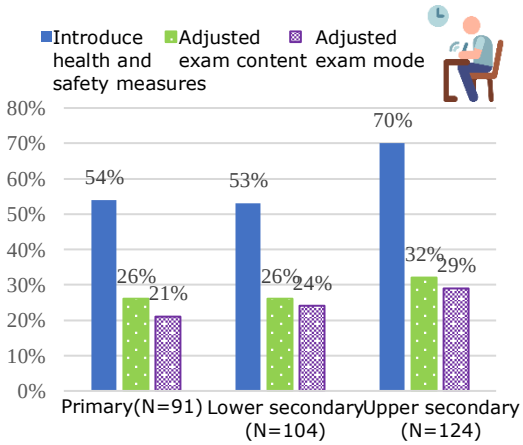

Examinations and learning assessments serve different functions. Examinations are used to certify or select learners in a given grade or age for further schooling, training, or work. In particular, national examinations can determine students' ability to progress further in their education and inform decisions on tracking students. Yet, the pandemic forced nearly all education systems around the world (around 95%) to implement changes to testing policies at all levels, changing the content, format, and administration of national examinations.

A global survey[54] showed that, in the 2019/2020 academic year, nearly half of the countries around the world rescheduled or postponed examinations at the primary level (49%), lower secondary level (51%), and upper secondary level (60%). Globally, 30% of countries canceled examinations at the primary level, 28% at the lower secondary level, and 18% at the upper secondary level. This is

due to the fact that national examinations at the upper secondary level tend to be important, as they typically certify the completion of the upper secondary level and can be used to progress to tertiary education. In addition, some countries introduced alternative assessments to substitute for national examinations (figure 2-8).

Most countries also introduced health and safety measures (figure 2-9) to contain the pandemic and ensure the safety of students during examinations, e.g., extra space between desks for distancing students, particularly at the upper secondary level, when important examinations are taking place (70%). Around 30% of countries adjusted exam content and mode of administration. For example, the subjects covered or number of questions. Slovenia reduced the content and number of test papers by 15% for oral exams. These decisions reflect the resource availability, different realities, and constraints that countries face when making choices about assessment and examination plans.




Source : OECDiLibrary,What's Next? Lessons on Education Recovery: Findings from a Survey of Ministries of Education amid the COVID-19 Pandemic

Figure 2-8 Share of Countries Who Changed the Scheduling of Exams Due to the Pandemic

Figure 2-9 Share of Countries that Adjusted Health & Safety Measures for National Examinations Due to COVID-19

In addition to changes to national examinations, some countries also included adjustments to graduation criteria as part of their school re-opening plan. Globally, 34% of respondent countries reported including plans to adjust graduation criteria for the 2019/ 2020 academic year for the primary level. This share increases gradually with each level of education, with 41% of countries doing so for lower secondary level and 47% for upper secondary level.

The COVID-19 pandemic also has implications for mechanisms that seek to assess and certify student learning, as well as those

mechanisms that allow for key decisions on students' progression. Education systems are also rethinking how best to adjust learning assessment and examination systems in the context of learning loss to effectively assess and certify students and ensure that the most disadvantaged students do not bear the brunt or become victims of improper mechanisms.

## Some countries had already adopted remedial measures to close learning gaps

As a result of suboptimal learning outcomes at home during school closures, many children are at risk of returning to school without having properly assimilated the course content and lagging behind upon return. Countries have therefore taken actions to mitigate potential learning losses. Government responses include mechanisms such as modifying the calendar and curriculum, introducing targeted remedial catch-up, adjusting teacher professional support, etc. The effectiveness of the policies often depends on the local context and baseline learning levels before the pandemic. In Taiwan, local councilors raised concerns from parents regarding students lagging behind and requested the Ministry of Education to conduct evaluations and, when necessary, offer remedial courses[55].

To close learning gaps, of the 143 respondent countries, 41% reported adjusting school calendars to extend the academic year, 42% reported prioritizing certain curriculum areas or skills, and 28% reported that schools/ districts could decide and implement adjustments at their own discretion. However, more than half (54%) of the countries report no adjustments have been or will be made at all education levels.[56]

Analysis from the OECD [57] suggests that when countries prioritized certain curriculum areas or skills when schools reopened, they were most likely to choose reading, writing, and literature as the priority subjects and, to a lesser extent, mathematics. Some countries used standardized assessments as a powerful tool to keep track of learning losses. In Chile, between March and April 2021, 7,000 schools and 1.8 million students took the Comprehensive Learning Diagnosis (DIA) developed by the Quality Education Agency to measure students' learning outcomes and assess their socio-emotional situation following school closures. The study revealed lower learning outcomes in mathematics and reading, and highlighted students' eagerness to go back to traditional ways of interacting with professors and peers[58].

Aside from standardized assessments, other common approaches to monitor learning losses include formative assessments by teachers at the classroom level and surveys. For example, results from a study by the Finnish Education Evaluation Centre (FINEEC) revealed important disparities in parental support across students. The study raised equity concerns knowing that students relied more heavily on home support in the absence of direct contact with teachers. In order to address this issue, the FINEEC highlighted the need to identify learners needing special support. The study also showed that students across education levels experienced study-related stress during the COVID-19 crisis. Together with monitoring equity in learning outcomes, keeping track of students' emotional well-being during and after school closures can be important, as well-being in childhood and adolescence can be a strong predictor of emotional well-being later in life[59].

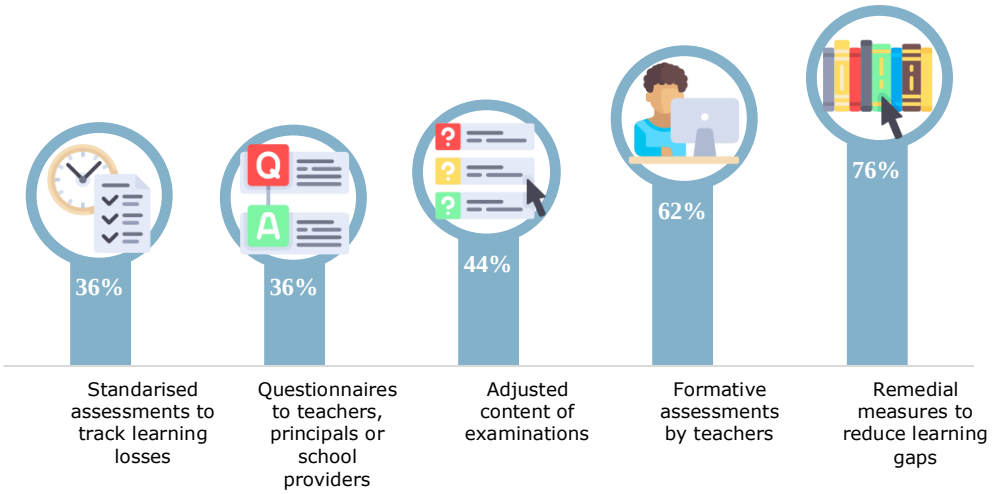
A number of countries have taken steps to address the learning gaps associated with school closures. For instance, the U.K. launched the National Tutoring Programme, in which the British government worked with 33 approved educational organizations to recruit and train tens of thousands of tutors. The tutors will then provide subject-based remedial education for primary and secondary students that have been the most impacted by the pandemic to close the learning gaps between them and their peers. In France, the program "Learning Holidays" was implemented in 2020 and 2021 to support students that may have been particularly affected by the COVID-19 crisis. This initiative builds on cooperation with local authorities and associations and has two main objectives: addressing learning gaps and reducing the risk of dropout; and ensuring children's access to enriching experiences during summer vacations[60].

Schools provide more than education as well. Long before COVID-19, schools have been an important platform for advancing the health and welfare of children. Without schools, children lose access to nutritious lunches, important health services, and social and psychological support, which are important factors that encourage parents to send their children to school. Estimations reveal that around 37 billion children across 150 countries lost access to nutritious lunches provided by schools at the peak of the pandemic and school closures[61]. Related evidence further shows that in this education crisis brought on by the pandemic exists a psychological health crisis among children and adolescents. Risks of child abuse and neglect increased with the duration of school closures, and it became less likely for these situations to be uncovered and reported. According to the Responses to Educational Disruption Survey[62] by

UNESCO and the International Energy Agency, many students reported feeling more lonely and were concerned that the disruption in their education would impact learning and future educational trajectories. Due to the pandemic, the prevalence of major depressive disorders and anxiety among adolescents between 10-19 increased by 34%[63].

Safe, healthy, and well-fed children learn better. Focusing on our children's health and happiness can help prepare them for learning. During the COVID-19 pandemic, without full support and referral systems, we were unable to provide the necessary foundations for children and adolescents to return to previous learning trajectories. Remedial measures in some countries included building emotional resilience and prioritizing prerequisite skills, such as reading, math, and fundamental socio-emotional skills, for further learning when adjusting the curriculum.

In the post-pandemic era, assessment of learning losses, curriculum prioritization, and adjusting course content to remediate learning losses are critical to helping students catch up once they return to school. Countries have proved that learning losses are not irreversible if we act quickly. Targeted support can aid the recovery of lost learning, bolster basic skills, and return students to a more progressive learning trajectory. It can also help transform education systems for the better, ensuring equality and inclusivity (Figure2-10).




Source : *OECDiLibrary, The State of Global Education 18 Months into the Pandemic*

Figure2-10 採取措施評量學習損失與解決學習差距的國家占比

## Section III Support for Secondary & Primary Teachers

The COVID-19 pandemic has disrupted our way of life. The adoption of remote education, the subsequent closures and return to school, and transitions between virtual and in-person instructions have had profound impacts on the works of teachers. Remote education and online learning are not new concepts; teachers have been teaching remotely and online since the early days of digital technology, but the pandemic has unexpectedly accelerated and ushered in the age of digital education, while testing teachers' abilities to use information and communications technologies.

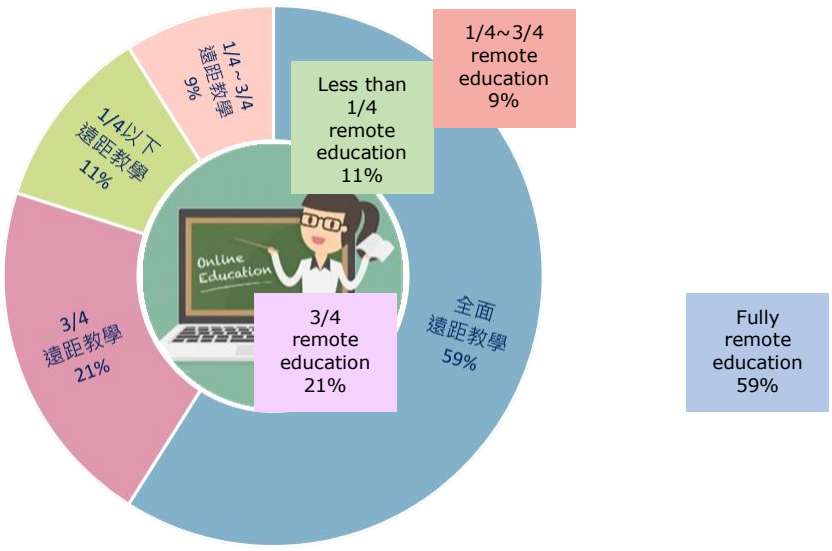
This crisis required many teachers to learn new skills and prepare materials for virtual learning. In some instances, this introduced new responsibilities to teachers. For example, teachers had to provide support and resources to students, increase interactions with parents, provide remedial teaching, or carry out new administrative, health, and safety tasks implemented by the school. Sometimes, the shortage of teachers further restricted what a school was able to accomplish, i.e., making it difficult for schools to adopt different hybrid learning modalities. This urged some countries to change how they dispatched and hired educational staff. But it also means that teachers are indispensable in ensuring learning continuity for millions of students around the world.

Since the COVID-19 pandemic emerged in Taiwan, the Ministry of Education has utilized ICT to connect resources such as digital learning platforms and ensure the use of digital technologies in classrooms. Starting in 2020, the Ministry of Education has subsidized local government and schools at the primary and secondary levels to organize digital teaching competency programs for existing teachers to provide a professional development platform for teachers to learn about digital education. According to information released by the Ministry of Education [64], in 2021, a total of 16,000 teachers participated in such programs. As of 2022, a total of 54,000 teachers, the equivalent of 27% of teachers at the primary and lower secondary levels in Taiwan, have participated in these programs. In 2022, county and city governments were estimated to have organized 797 workshops aimed at promotion and prevalence. The Ministry of Education hopes that the digital teaching competency programs could help familiarize teachers with applying digital resources in their classrooms, thereby subverting traditional interaction modes found in traditional classrooms to carry out a student-centric learning model that could fulfill the needs of different students.

During the pandemic, the success of response measures adopted by governments to target education depended largely on the skills and competencies of the country's teachers. To help the professional development of teachers, the Ministry of Education also set up exchange platforms for teachers on social media platforms to urge teachers to grow their competencies in the use of digital technologies, creating course content, and designing learning activities so that teachers were able to adjust their teachings based on the learning needs of their students. Co-prep communities for teachers in Taiwan also rose greatly in numbers during this time. To attract student participation with remote education content, teachers spared no efforts, discussing in co-prep communities to share course designs and educational philosophies. The communities also became support systems for teachers.

## COVID-19 crisis transformed how teachers work

As countries closed schools during the pandemic, most teachers were asked to teach remotely. Surveys show that 59% of countries reported that all teachers were required to teach remotely/ online; 21% of countries reported that 3/4 of teachers were required to teach remotely; 9% of countries reported that around 1/4 to 3/4 of teachers were required to teach remotely; and 11% of countries reported that less than 1/4 of teachers were required to teach remotely (figure 2-11).

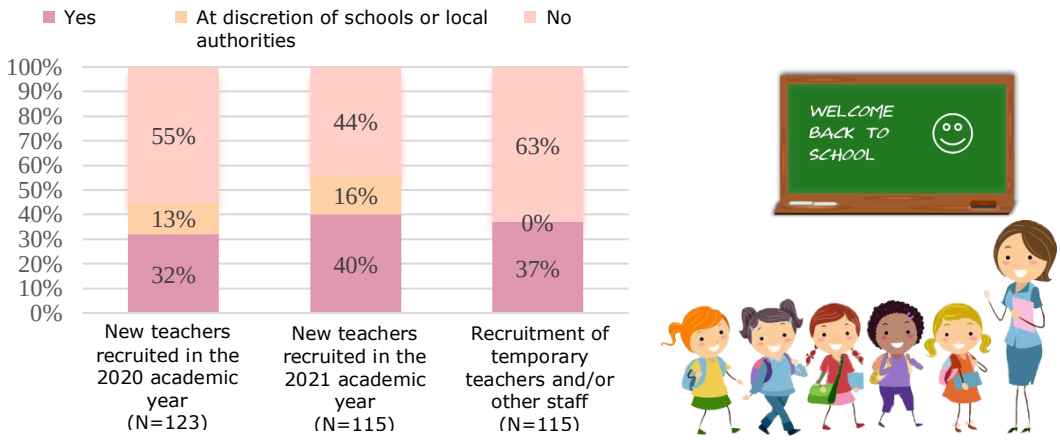



Source : *OECD (2021), The State of School Education: One Year into the COVID Pandemic*

Figure 2-11 Share of Counties that Adopted Remote Education Due to the Pandemic

In response to this crisis, some countries adjusted the dispatch and salary of teachers. For example, in the Slovak Republic, teachers that refused or were not able to teach remotely during school closures saw their salaries and benefits decrease by 20%. In Slovenia, schools at the pre-primary and primary levels received additional funding to hire technicians to support ICT infrastructure. Teachers in Slovenia, upon approval from their schools, were compensated financially for the use of their own resources when working from home and received risk subsidies when working in schools. In France, 5,000 temporary teachers and support staff were hired in April 2021 to cover for the absences of teachers testing positive for COVID-19. In Luxembourg, temporary staff were hired to assist teachers with administrative tasks as well as with support to students in remedial programs[65]. In Japan, schools at primary and secondary levels received funding in 2020 to adjust the composition of their employees and hired more support staff in March 2021 to reduce teaching workloads (the program is estimated to add up to 84,900 support staff in primary and lower secondary schools, with each school hiring, on average, 3 new support staff)[66].

On average, 32% of countries hired additional teachers to support teaching in the 2020 academic year; this percentage increased to 40% in the 2021 academic year. In this school year, 16% of countries allowed schools/ districts to hire more teachers at their own discretion. In addition, 37% of countries hired more support staff for schools to minimize the impact of the pandemic on students (figure 2-12).




Source : *OECD (2021), The State of School Education: One Year into the COVID Pandemic*

Figure 2-12 Share of Countries Hiring Teachers & Other Educational Staff in Response to the Pandemic

## Non-teaching tasks during school closures

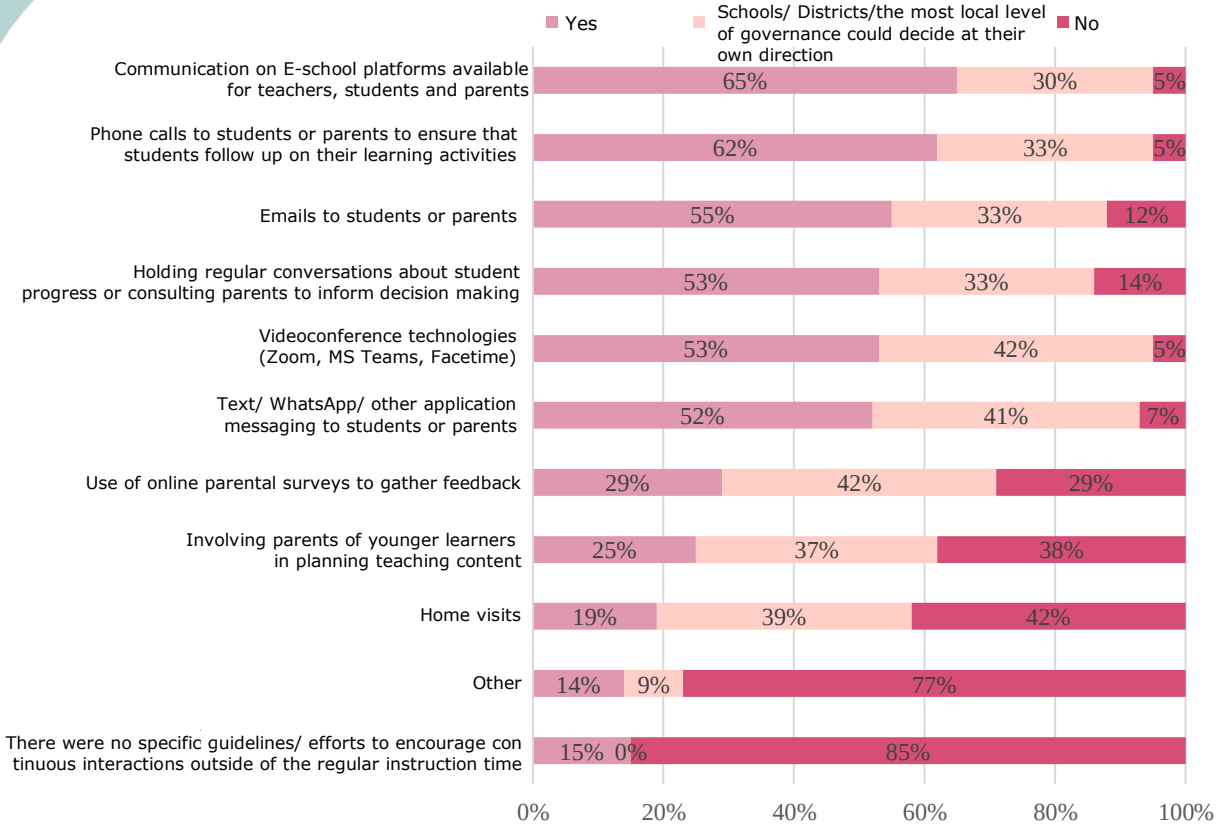
Almost all countries required teachers to take on non-teaching tasks, e.g., communication and cooperation with parents/ guardians and complying with administrative works and health and hygiene processes required by schools. School closures changed the forms and number of interactions between schools and families. During school closures, to ensure interactions between teachers, students, and parents, governments often provided directions on potential communication channels.

Maintaining close relationships between teachers, students, and parents during school closures is critical to ensuring learning continuity. For students, remote learning is filled with challenges, e.g, staying focused for online lessons and maintaining motivation and participation without direct teacher supervision during self-directed learning. More evidence is showing that meaningful interactions between teachers and students are critical for successful remote learning [67] . Many countries, therefore, encouraged teachers to continue some form of interaction with their students and parents outside of the regular instruction time. For example, teachers in the Czech Republic were encouraged to provide each student with an individual consultation via email, phone, or in person, as well as to gather feedback from parents through online surveys. In Portugal, teachers and local governments joined forces with security forces and official mail services to create a support network during school closures to ensure the supply of study materials and daily contact with students, regardless of the material and technical conditions students had at home[68].

According to OECD analysis[69], during school closures, the most common forms of interactions encouraged by governments included "dedicated e-school platforms made available for teachers, students, and parents," "phone calls to student or parents to ensure students are keeping up with learning activities," or "sending emails to parents or students." Other forms of interactions that were also encouraged include "regularly talking to students or parents about learning progress and informing decisions," "videoconferencing," and "sending SMS or messages through WhatsApp or other applications to parents and students." Less common forms of interactions include "gathering

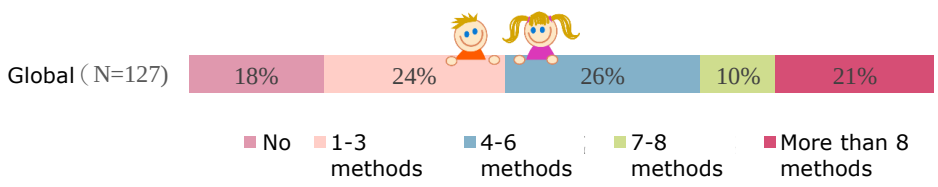
parent feedback through online surveys," "inviting parents of young children to help with lesson planning," and "home visits." As the public was asked to maintain social distancing during the pandemic, home visits were the least encouraged form of interaction (figure 2-13).

On average, as shown in figure 2-14, 31% of countries encouraged seven or more different methods of interactions between teachers and parents/ students; 26% of countries encouraged four to six different methods; 26% of countries encouraged one to three different methods; and 18% of countries reported that they didn't encourage any specific interactions between teachers and parents/ students, or left it at the discretion of schools or districts[70].




Source：*OECDiLibrary,What's Next? Lessons on Education Recovery: Findings from a Survey of Ministries of Education amid the COVID-19 Pandemic*

Figure 2-13 Interactions Encouraged between Teachers and Parents and/or Students During School Closures



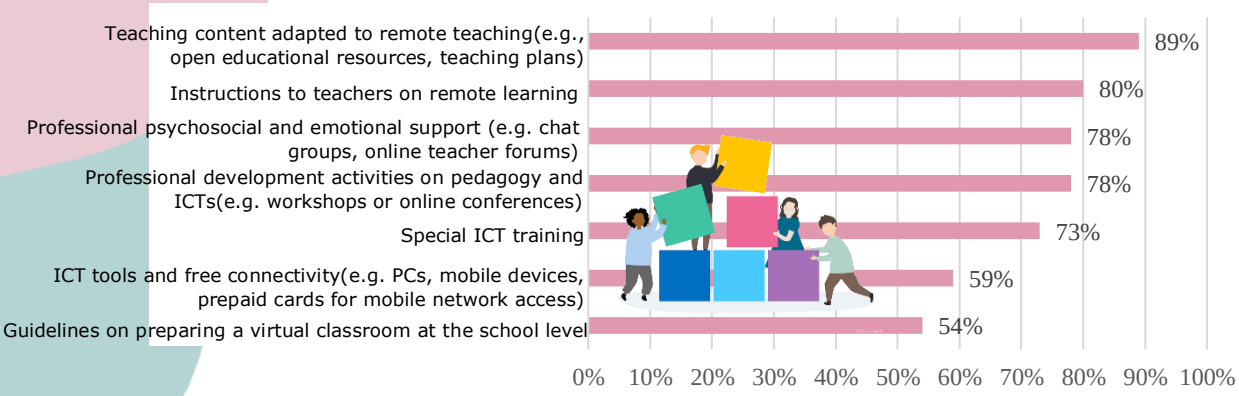
Source： OECDiLibrary,What's Next? Lessons on Education Recovery: Findings from a Survey of Ministries of Education amid the COVID-19 Pandemic

Figure 2-14 Number of Interactions Encouraged between Teachers and Parents and/or Students During School Closures

## 3 Preparing teachers for remote/hybrid education

To help teachers adapt to the challenges of remote and hybrid education and ensure learning continuity for students, most countries provided teachers with various support to increase their level of happiness. Whether teachers were equipped with the skills to use computers, software, or the internet was one of the most frequently mentioned challenges when schools were forced to shift to remote or online education during the pandemic. COVID-19 unexpectedly resulted in a rapid increase of primary and secondary teachers receiving training for using ICT tools, which rose by at least 25 percentage points. In Chile, for example, the Centre for Improvement, Experimentation and Pedagogical Research (CPEIP) and the Innovation Centre of the Ministry of Education held a series of free online conferences and training sessions on distance learning using ICT (as well as on other topics such as teacher well being and socio-emotional learning in the context of the pandemic). These were attended by more than 125,000 teaching professionals, representing 56% of all the teachers working in subsidized schools[71].

In general, the most common support provided to teachers, as shown in figure 2-15, includes "teaching content adapted to remote teaching (e.g., open educational resources, teaching plans)" (89%) and "instructions to teachers on remote learning" (80%); followed by "professional psychosocial and emotional support (e.g. chat groups, online teacher forums)" (78%), "professional development activities on pedagogy and ICTs (e.g. workshops or online conferences)" (78%), and "special ICT training" (73%). Countries with higher income levels also provided "ICT tools and free connectivity (e.g. PCs, mobile devices, prepaid cards for mobile network access)" (59%) and "guidelines on preparing a virtual classroom at the school level" (54%).




Source : *OECD ; The State of Global Education: 18 Months into the Pandemic*

Figure 2-15 Share of Countries (N=128) Providing Support to Teachers

According to an OECD survey[72], many countries were also dedicated to supporting teacher networks and the establishment and expansion of professional communities. Before the pandemic, few OECD countries provided support to strengthen cooperation or feedback among teachers when compared to traditional professional development formats such as workshops. Participation in professional networks, peer observations, or practices was still limited among teachers. When delving into specific goals set by systems or schools, cooperative learning is particularly effective in strengthening the skills and professional knowledge of teachers[73]. Digitalization during the pandemic urged many countries to strengthen support for teacher networks or professional teacher communities. When coupled with initiatives driven by teachers through mutual support, the pandemic accelerated the establishment and expansion of such networks and communities. For example, the Flemish Community in Belgium was able to support interactions between teachers by redesigning teacher forums and launching new online conferences on the foundation of existing online education platforms[74].

Due to epidemic prevention measures, most professional development activities for teachers were moved online, which posed a major challenge for teachers that are already unfamiliar with online learning modalities. To help teachers participate in professional development activities online, many countries helped teachers meet the necessary pre-conditions, for example, providing ICT tools and free internet connection to support ICT-related professional development that could build digital competency. Yet, technology alone does not guarantee the quality of professional learning among teachers. Specific designs, such as learning spearheaded by experienced moderators in online communities or interventions to increase course completion are helpful for strengthening outcomes. As such, professional teacher development has been gradually trending toward hybrid (virtual & offline) events. Hybrid events are comprised of different formats, providing more flexibility for professional teacher development. Hybrid events can also reduce costs, remove time restrictions, and be integrated with more impactful learning modalities such as coaching, mentorship, or outside support [75]. The pandemic will gradually strengthen the digitalization of professional learning systems for teachers and professional teacher development will shift to focus more on hybrid learning modalities, which presents a new opportunity for development.

Teachers in most countries were forced to shift to remote/ online learning and adopt different approaches to interact with students and families to ensure that students can continue learning safely during school closures. As teachers continued to serve on the frontlines during the pandemic, adaptability in teachers was a representation of an education system's resiliency under crisis and a critical link for governments promoting remote/ online learning. As such, teachers

received many forms of support during this time. Evidence shows that emotions and stress levels in teachers have an impact on the emotions and stress levels of students and other teachers[76]. During the pandemic, many countries also focused on the psycho-socio health demands and skills of teachers to help them as they continued to adapt to their changing work so that they can also support better mental health in their students and other teachers. As the pandemic continues to spread, teachers, with the support of governments and parents, are also working hard and leveraging their creativity and minds to tackle the challenges ahead.

# Chapter III

## Education Innovation During the Pandemic

北冥有魚，其名為鯤。鯤之大，不知其幾千里也。化而為鳥，其名為鵬。鵬之背，不知其幾千里也；怒而飛，其翼若垂天之雲。是鳥也，海運則將徙於南冥。南冥者，天池也。

《莊子，逍遙遊》

# Chapter III Education Innovation During the Pandemic

The COVID-19 pandemic has resulted in substantial losses to global education. Spotlighting these losses could help support education systems that are working hard to return to pre-pandemic levels. Yet, we must also consider the possibility of this being a blessing in disguise and view education during the pandemic as a transformative journey if we wish to leverage the crisis to reopen better schools and rebuild the education system we need in the future.

Case studies are helpful for motivating and supporting countries facing similar challenges and could inspire them to formulate solutions suitable to their backgrounds. During the COVID-19 crisis, governments and civil societies developed ways to continue providing educational opportunities. Schools and educators exhibited incredible leadership, initiative, and innovation in responding to the crisis. Many education systems have already adapted to the crisis in their own ways and there is much to learn for all of us.

Organizations such as the OECD, World Bank, Global Education Innovation Initiative by the Harvard Graduate School of Education, and HundrED joined hands during the pandemic to archive actions adopted by countries to ensure learning continuity throughout school closures and published *How Learning Continued during the COVID-19 Pandemic: Global Lessons from Initiatives to Support Learners and Teachers*[77]. The report describes 45 different case studies where governments, NGOs, and companies launched concrete solutions to support teachers and learners, using experiences from rapid response measures to offer inspiration for education in the post-pandemic era.

*Learning to Build Back Better Futures for Education: Lessons from Educational Innovation during the COVID-19 Pandemic*, published by the International Bureau of Education under UNESCO, spotlights 31 innovative programs during the pandemic[78]. The programs were selected because they address elements of a vision of the future of education that are ambitious and forward-looking, seek to educate students holistically, are designed to strengthen the resilience of students and schools, and of communities at large. They were selected also because they demonstrated an ability to scale up and to do so in sustainable ways. The book analyzes innovative programs from kindergarten to twelfth grade, examines the type and domain of the programs, and studies the conditions and processes which made them possible.

This chapter will introduce a few innovative programs from *Learning to Build Back Better Futures for Education: Lessons from Educational Innovation during the COVID-19 Pandemic*, including innovations supporting remote education, students' socio-emotional health, professional development for teachers, and family engagement in remote education. Researching innovative programs provides practical resources, positive evidence, and reasons for hope, all of which are helpful in reconstructing teaching and learning in the post-pandemic era and inspiring education leaders to learn from invaluable experiences, thereby reshaping education in a more effective manner.

## Section I Innovations Supporting Remote Education for Students

During the pandemic, one of the biggest concerns for educators was how to substitute in-person instruction so that students could continue learning at home. As such, most innovative programs aimed to support remote education for students. However, even the most basic forms of remote education required teachers to think first about students as learners, rather than about content delivery. In that sense, they represent an important innovation and step forward from traditional forms of education that are teacher- and content-centered.

### Using digital technology to support learning innovation

Some technology applications involved teachers producing and recording lessons using various devices, including video, audio, and printed materials, such as study guides, representing an improvement on the traditional form of instruction. When students watch a video or read a text, the video or text can be re-read/ re-watched or read/ watched at various speeds in ways that in-class lectures cannot provide. Remote education during the pandemic has accelerated the use of digital technologies to support learning innovation. For example, in Egypt, the government launched the Egyptian Knowledge Bank (EKB) to support remote education by providing free digital resources[79] to all Egyptians.

Launched in 2016, the EKB is the largest digital learning platform in the Middle East and North Africa (MENA) region and was originally designed to provide higher education researchers with free high-quality resources and international journal access. EKB has since grown to expand services to all Egyptian citizens. After the COVID-

19 outbreak, the Ministry of Education and Technical Education (MoETE) announced that they would be launching a new learning portal under EKB to provide interactive videos, games, speech texts, and other forms of lessons to K-12 (kindergarten to twelfth grade) students.

The EKB currently has four portals: general readers, scholars and teachers, students of all ages, and children. Users can access all by registering with their national ID number or student information. They can then pick one of the portals to be their primary source of focus. Each portal includes encyclopedias in English and Arabic, online journals and periodicals, online dictionaries, interactive lessons, and various books and scientific articles that cover a wide range of needs, from early childhood to graduate-level studies. Users can navigate topics of interest using a search engine or drop-down lists based on different categories.

EKB has developed into a private-public partnership (PPP) model that works horizontally, i.e., private partners are responsible for the content and training, while each core EKB team manages the coordination and technical support in partnership with the Egyptian National Scientific and Technical Information Network. EKB currently has more than 150 partners from private and international organizations, such as Britannica, National Geographic, Discovery Education, and local Egyptian partners.

In response to the COVID-19 pandemic, EKB's partners developed new resources and tools to assist remote education, including three hours of newly produced online video programs, broadcasted daily on WebEdTV, customized to the Egyptian K–12 national curricula for all grades. Moreover, the EKB launched new MoETE TV channels to offer newly developed, game-based, and engaging content to students with little or no access to technology.

## Innovations supporting personalized learning

During the pandemic, some innovative programs provided more opportunities for personalized learning than traditional teacher-centric education models. For example, the U.K. government announced the National Tutoring Programme (NTP) in November 2020 to make highly flexible tutoring options available to students with different demands to support students whose education has been affected by school closures[80].

The NTP is a charity-led, government-funded initiative. Education charity foundations looked into empirical research and emphasized

the consistent and substantial positive impacts on learning outcomes of tutoring programs. The evidence also shows that tutoring can be used as an effective complementary tool for schools to accelerate the learning of their students. In the U.K., tutoring is popular in wealthier homes. Taking empirical research and the growing demand for private tutors during the pandemic and school closures into account, the U.K. government approved the policy proposal and introduced tutors into the education system.

The NTP consists of two pillars: NTP Tuition Partners: Participating schools can access tutoring from a list of approved external Tuition Partners to offer 15 hours of tutoring to students with related demands. These Tuition Partners are given government funding to recruit and train tutors and will send staff to supervise sessions provided by tutors. NTP Academic Mentor: Full-time academic instructors, with full training, are employed by schools in remote areas to provide intensive catch-up support to their students, allowing teachers in these schools to focus on their classrooms.

Ahead of the formal roll-out of the NTP in November 2020, the Education Endowment Foundation (EEF) commissioned a National Online Tuition Pilot which aimed to test how effectively disadvantaged students could be reached through online tutoring during the period of COVID-19 school closures[81]. More than 1,600 students in 70 schools participated in the pilot study, which concluded that delivering online tutoring during school closures was feasible and could have a wide reach in a short period of time. Outcomes for students included increased confidence, engagement, and preparedness for future learning.

## Innovations for learning assessments

Another area of educational innovation was learning assessments. When teachers are unable to meet with students in person, it becomes difficult to assess classwork and provide formative feedback. While learning remotely, students submit work on a digital platform and receive feedback on that platform. They can then respond to the feedback which creates a feedback loop. These simple innovations have powerful effects in allowing for more feedback than traditional paper-based classwork and are thus more effective in supporting learning. In Norway, when exploring the potential of remote and hybrid learning, teachers consistently underscored the use of Microsoft Teams, Google Classroom, and similar platforms for digitalization and real-time cooperation/ feedback on classwork as an important innovation[82].

The case data stem from a targeted focus group conducted with five school leaders and a teacher survey with 726 teachers. The survey showed that digital infrastructure in Norwegian schools is good and all schools were using platforms such as Teams, Showbie, and Google Classroom. While these platforms have been available for some time, they saw increased and innovative uses during periods of remote and hybrid learning.

While teaching remotely, Norwegian teachers tried new ways to provide feedback, using Teams, Google Classroom, and similar platforms to conduct digital assessments and experienced related benefits. On these platforms, students demonstrated their competence through digital videos, audio files, and other multimodal formats, while teachers followed the students' real-time learning trajectories in shared collaborative documents. Remote education has given teachers more opportunities to monitor student learning and provide real-time feedback on learning processes. For example, teachers could continuously monitor student learning by checking a digital notebook (OneNote) and providing feedback for students requiring additional support. Teachers could also ask students to make videos to explain their mathematical reasoning and send them back to the teacher. In that way, the teacher received more insight into students' learning processes.

Though not all teachers have innovated the way they assess learning, many teachers have interacted digitally with their students over classwork and reported that they will continue to develop this approach in the future, reflecting the significant potential of using digital tools to provide real-time feedback, which is an important link in effective teaching.

## Innovations supporting independent learning

Digital technologies can address many problems caused by the global education crisis; digital applications designed for independent learning can also ensure learning continuity during school closures. For example, the Teach the World Foundation (TTWF) provided gamified smartphone applications to increase independent learning opportunities for low-income students in Bangladesh, Pakistan, and other regions where students did not have access to quality education, thereby reducing learning losses during the COVID-19 pandemic[83].

TTWF's K-5 (kindergarten to fifth grade) literacy program leverages existing infrastructure, e.g., the smartphone of a child's parent or sibling, to provide gamified applications that are

administered by the TTWF team. The target demographic is either out-of-school children or children in schools offering a poor quality of education. The application is either delivered to students through an SD card or downloaded from the Google Play Store. The key features of the program are its low cost, minimal infrastructure investment, and the application's ability to work offline, allowing students to learn anytime and anywhere.

In Bangladesh and Pakistan, the program is implemented jointly by the TTWF and local partners. Participating students are largely from refugee camps, slums, or out-of-school student populations. The students are given a syllabus, schedule, and details of the requisite number of hours per day to be spent on each subject. Subject-specific gamified applications are the main source of content, including award-winning applications such as Footsteps2Brilliance and Google Readalong for literacy, and local applications such as Sabaq and Taleemabad for mathematics and local languages. These applications provide engaging, fun, and interactive content and formative assessments through instant feedback – all of which support self-learning.

Each group of students is assigned a facilitator, who remotely manages and supports the student, providing regular check-ins with students and parents, and offering technical support. The program emphasizes self-learning, eliminates the role of teachers, and the entire onus of learning is on the student. Facilitators are only there to provide necessary support and troubleshooting. It is a wholly student-centered model; students progress at their own pace, depending on their grasp and mastery of the content. Students take responsibility for their own learning and education, rather than being passive learners.

The TTWF initiative provided gamified applications to students lacking resources, using engaging, fun, and interactive content to cultivate literacy and mathematical skills, allowing students to become more independent learners and mitigating learning losses during the COVID-19 pandemic.

## Innovations supporting deeper learning

During the pandemic, few educational innovations focused on exploring experiences and deep learning and only a couple relied on project-based and experiential learning as a way to help students learn from their own activities and experimentations. One of those was launched by Kide Science, an edtech company based in Finland

that has translated its interactive science education model for remote learning in the home environment. The innovation has been used to support parents in working with their children for deeper learning[84].

In 2017, Dr. Jenni Vartiainen founded Kide Science to provide early childhood and primary school educators with research-backed and technology-oriented solutions. Kide Science developed an innovative and recognized science pedagogy for young children, enabling children to learn science and inspiring interest in the subject through stories and games. The Kide Science pedagogy also highlights science, technology, engineering, arts, and math (STEAM) content to teach children to become the problem-solvers and creative thinkers that future society needs.

Kide Science's online platform provides an inquiry-based lesson plan and professional development and training for STEAM education. During the pandemic, Kide Science quickly translated onsite lessons to online lessons, while maintaining fidelity to the fundamental pedagogical approach and ensuring minimal impact on student experiences. Online lessons generally follow the same structure as onsite lessons and the actual experimentation phase is exactly the same in both modes. The most notable differences between regular and distance learning lessons are in the preparation, entering the science adventure, and communication practices with children.

For children, Kide Science appears as stories and hands-on inquiry activities that require, on average, between 2 and 7 supplies. In remote learning settings, parents have to prepare the supplies required for science experiments before the classes, and the supplies are common household items, such as plates, water, sugar, flashlights, etc. Kide Science's remote learning program instructs teachers on how to help students enter the science adventure and reminds parents to act as research assistants. Next, teachers begin reading the story, as they would in onsite lessons, to guide children into the experiment and solve problems presented in the story. Unfortunately, interactions through screens are simply incomparable to in-person interactions and so Kide Science's remote learning program also instructs teachers on how to encourage students to showcase their works and share their ideas in remote learning settings.

Early childhood science education is traditionally heavily dependent on hands-on experimentation in carefully scaffolded in-person learning environments, but the global pandemic has introduced innovation to science education for remote learning. Kide Science translated its pedagogical model of early science education

to be fully remote, enabled for educators and for parents, and to effectively support young children's engagement in remote learning.

## Section II Innovations Supporting the Socio-emotional Health of Students

The psychological health of students became a topic demanding concern during the pandemic as students are unable to focus on learning when they are fearful or anxious. As such, several innovations recognized attention to socio-emotional development as going hand in hand with academic learning. For example, secondary schools in Finland employed project-based learning to teach science remotely. By using the break-out room function available in Google Classroom, the PBL format aimed to enable collaboration among students and reduce feelings of loneliness. In addition, some innovations focused on improving the socio-emotional well-being of students. For example, Columbia provided audio-based education programs through radio stations to support the socio-emotional well-being of refugee children from Venezuela[85].

In Columbia, refugee and migrant children affected by disaster, conflict, and displacement are often at the greatest risk of learning disruption as they are less likely to re-enroll in schools once they reopen. To mitigate the negative effects of COVID-19 on these children, the International Rescue Committee, with funding from the Lego Foundation, launched the Play Well program in September 2020, hiring experts to develop a socio-emotional learning (SEL) framework that suited the needs of refugee children living in Colombia.

Due to the inadequate digital infrastructure available to regions where refugees are living and the high costs of data transmissions, the Play Well program designed an audio-based program called AI Aire con Enrique for refugee children in Columbia. The show is designed for children between ages 6-12 and aims to strengthen socio-emotional skills in children through games. Each episode is 25 minutes long and broadcasted mainly on radio stations and streaming platforms. Audiences can also access content on mobile devices through SMS, WhatsApp, and interactive voice response (IVR).

In AI Aire con Enrique, Enrique is a curious chameleon that likes learning about the world, his friends, and various feelings. The program has 20 episodes and the contents featured include news, interviews, and commentary on Enrique's village. In each episode, children are invited to participate and engage with the content by listening for specific information or reflecting on their own relevant

experiences. For example, the topic of the first episode is home and migration. Listeners are invited to think about three things they miss most when they are far from home. The program also explores feelings of shyness, being different, positivity, and other socio-emotional topics. Although the show's target audience is refugees and migrants, the content is applicable to all children who can explore the world through their senses.

Emotional regulation and identity are crucial for children because a deeper understanding of themselves will enable them to express their feelings, which then prevents emotional stress and low self-esteem from impacting their learning and development. The audio-based delivery method through low-tech channels gave learners in low-resource communities access to high-quality educational opportunities.

## Section III Innovations Supporting Development of Teacher Competencies

Due to demands from remote education, we also saw a rise in training programs related to professional development for teachers. These programs attempted to help teachers cultivate a breadth of competencies that would help them create new pedagogy and learning experiences for their students. For example, Brazil accelerated change in teachers' in-service training to support digital and teaching competencies in teachers[86].

In March 2020, Brazil shut down schools without prior planning due to the COVID-19 pandemic, leading many teachers to be fearful and anxious as they felt that they didn't have the skills required for remote education. State departments of education in Brazil responded to teachers' need for professional development by accelerating change in teachers' in-service training: providing innovative programs such as peer-to-peer learning, training in the use of specific online platforms, and emotional support.

### Ceará, Brazil

The Department of Education in Ceará, located in Northeast Brazil, created a developmental journey to train digital teaching competencies and ensure that teachers would have the basic skills to use technology to teach remotely. To be able to personalize the learning, teachers were required to undertake a self-assessment, developed by the Center of Innovation for Brazilian Education, to

identify their level of digital competency in three dimensions: pedagogy with ICT, digital citizenship, and using technology for professional development. The department also created a new position called Agent of Educational Innovation (Agente de Gestão da Inovação Educacional, AGI), an edtech professional responsible for supporting the design and implementation of hybrid learning in schools.

## Espírito Santo

During the pandemic, the Department of Education of Espírito Santo, in Southeast Brazil, offered four strategies for professional development during the pandemic: teaching communities, webinars, online formal courses, and a website with digital materials and tutorials. Using the Teachers' Digital Competencies Self Assessment Tool developed by the Center of Innovation for Brazilian Education, the Department of Education assessed the level of competency in teachers to identify ICT leaders for the new teaching communities. These teachers then received further training to develop their digital skills. The Department of Education also offered emotional support for teachers through a partnership with a national non-governmental organization (NGO), which has a platform addressing teachers' emotional and professional needs.

## Paraná

The Department of Education of Paraná, in South Brazil, implemented a new strategy for in-service training called Teachers in Action (Professores em Ação). Based around study groups, Teachers in Actions trained teachers to develop lesson plans and encourage educational innovation. The department launched a public selection to find leaders for the study groups across different curricular areas and grades. The selected teachers would then receive further training. The Department of Education has a team of professionals to support the leaders of the study groups in producing digital materials for curriculum content. The program also created a Teachers Channel (Canal do Professor) on YouTube to offer digital content, social interaction, and technical support.

Although the development of professional competencies should start during teachers' preservice education, the rapid evolution of edtech in the 21st Century means that teachers must also now become lifelong learners. As technology's impact on education continues to grow, digital competency will become a fundamental

requirement among teachers. The case study from Brazil reflects the importance of digital competency assessments in teachers, which is a foundation to ensure that all teachers are sufficiently participating in training programs. Brazil has accelerated change in in-service training programs and effectively strengthened digital competencies in teachers, enabling teachers to become agents for education transformation.

## Section IV Innovations Supporting Family Engagement

While learning remotely, students had to learn from home and so the role of parents in supporting their schoolwork became critical. A number of innovations focused on developing the competencies of parents to support their children's learning more effectively; others spotlighted the formulation and implementation of family engagement frameworks to achieve educational equality and social justice. For example, a family, school, and community engagement initiative in the state of Massachusetts, U.S. developed an inter-departmental and systematic framework to build dual-capacity and two-way communication between educational institutes and families to mitigate inequality exacerbated by the pandemic[87].

Prior to the pandemic, various districts in Massachusetts supported practitioners across healthcare, early childhood, education, and human and public services to facilitate family engagement and support family needs. Yet, the extent of training, education, and experience vary greatly across the realm of family engagement professionals. As such, the Massachusetts Statewide Family Engagement Center (MASFEC) developed a coalition for family engagement and a framework titled "Strengthening Partnerships: A Framework for Prenatal through Young Adulthood Family Engagement in Massachusetts" in support of practitioners across healthcare, early childhood, education, and human and public services. After the COVID-19 outbreak, the framework was further developed and innovated to mitigate the pandemic's impact on education.

One of the first steps taken to implement the family engagement framework was to promote a bilingual family, community engagement specialist and leader to lead family engagement at the state education agency to coordinate and build the capacity of the state and the districts it serves. One implementation strategy that came out of this role was that of 'cultural or power brokering,' which

has proven particularly useful during the pandemic, in particular, to encourage enrollment, vaccination, and return to in-person learning.

Cultural or power brokering is a practice that seeks to intervene and dismantle the power dynamic that families experience. When interacting with educators, schools, and districts, families may experience clear power dynamics, meaning that the powers wielded by the various parties are, to a certain extent, unbalanced. The process for cultural brokering consists of recruiting individuals who serve as leaders in their specific communities (racial, linguistic, and/ or cultural/ religious groups) to build equal partnerships. Cultural brokers must learn how to serve as a liaison or bridge between the school or education system and the diverse families it serves. The ultimate goals are focused on dual-capacity building: for the broker to connect and build relationships with all members of their particular communities, uncover their demands, and convey critical messages; for schools and systems to better understand and truly respect the values and beliefs of each community; and to value families as equal partners who feel welcomed at their child's school and understand their roles, rights, and responsibilities.

In order to establish a common understanding of family engagement, the MASFEC first provided training to family engagement workers during the pandemic, developing their practice and application of two-way communication, dual capacity, culturally relevant practices, and cultural brokering. In the spring of 2021, MASFEC conducted listening sessions and affinity groups for families to gather qualitative data through multiple virtual gatherings. Educators and program directors reported that social media was a more effective way to connect with families than phone calls, letters, emails, or text messages. Class Dojo and Remind App were helpful when conducting two-way communication with families; through them, teachers communicated tasks and activities, while caregivers could communicate directly with their child's teacher. Other apps, such as Early Family Literacy, Animal Antics, Small Wonders, 52 Essential Questions, Conversations, and 52 Essential Coping Skills were also shared as ways for families to engage in literacy learning to improve SEL in children.

In addition, the Parent Institute for Quality Education (PIQE) implemented a nine-week family engagement education program, training families on ways to support their child's education, communicate with teachers, the steps needed for their child to access college, support emotional development, and to steer their children away from risks such as gangs and drug use. The program shared

with parents the importance of education for their children and how to effectively grasp and impact the education system. At the same time, PIQE worked with teachers to shift teacher attitudes towards families, help teachers interact with families of different socio-economic or cultural backgrounds, and share ways to communicate more effectively with families so as to include families as equal partners and to offer specific strategies to help their children.

The U.S. case study has shown that, when planning family engagement, we must think in terms of multi-tiered systems of support (MTSS) and universal design for learning (UDL) to support its importance. Cooperation across education, people, and social service agencies in consideration of family needs, assets, roles, and values to provide adaptive and supportive policies and practices as well as using technology to eliminate barriers to family engagement can increase the drive and capacity for family engagement and build a connection between families, educators, and decision-makers, thereby increasing family well-being and student academics. It can resolve imbalances found in traditional power dynamics between families, schools, and community engagement practices to achieve greater equity in education and social justice.

## Section V  Lessons Learned from Educational Innovations

Educational innovations during the pandemic have inspired various new ideas on how education can better respond to student demands. Though these ideas were conceived under the various limitations imposed by the crisis, many practical approaches supporting learning adopted student-centric designs and re-imagined the potential effects of families, students, and communities working together to develop solutions to existing problems that can also satisfy future needs. As such, the impacts and effects of educational innovations can reach beyond the pandemic. These innovations not only facilitated remote education and mitigated learning losses from school closures, they were forward-thinking in the ways they resolved existing flaws in schools and education systems and they also supported students to develop necessary skills for the future. There are many lessons to be learned from the teaching and learning that happened during the pandemic. These lessons can help us rebuild a more effective and equitable education system after the crisis.

## Educational innovations originate from the resilience of education systems

Quickly adopted as a substitute for in-person instructions, remote education during the pandemic was not perfect in the least but was, nonetheless, a testimony to the resilience of education systems. In the face of this pressing public health crisis, governments and societies had to de-prioritize the demands of education. The necessity and duration of school closures were, in and of itself, a policy choice. Yet many governments, private organizations, and frontline educators worked hard and leveraged their creativity to quickly learn and produce collective wisdom within a short few weeks. They then rapidly shared their experiences to resolve existing challenges so that students could continue to learn during the crisis.

Often impeded by people's lack of understanding, innovation in education often requires a long time to take hold and scale up. Thankfully, modern ICT has been able to drastically improve communication and coordination mechanisms, supporting education decisions even when circumstances are highly uncertain. These educational innovations reflect how much societies value education and show that actors in specific education ecosystems are able to jointly or independently develop solutions, proving that different learning and teaching approaches are feasible. Some measures further prove that there is significant room for rebuilding and innovation in formal education and that we could seek a balance between self-directed learning, parent-involved learning, teacher-supervised learning, and peer learning. When facing changes and challenges, education systems must maintain a level of resiliency to inspire innovative thinking and provide better ideas and practices for different education models in the future.

## Resilience of education systems determined by how they leverage existing advantages

The COVID-19 pandemic has resulted in substantial learning losses. The sum of contributions from educational innovations is not nearly enough to compensate for lost learning opportunities from school closures. Students from different regions or socio-economic backgrounds received drastically different support from family, including learning environments, spaces, information equipment, or

parental support. These innovations were conceived by education organizations that have long been spotlighting the poorest and most marginalized communities. Their innovations aim to provide comprehensive support to students, including food and nutrition, software, hardware, and SEL to ensure that students have access to more equitable education opportunities. This was a testimony to the values of alliances or organizations spotlighting the educational needs of disadvantaged families or marginalized children. Their long-term experiences facilitated efforts for innovation to promote equitable education and holistic development during the pandemic.

Educational innovations around the world showed that there are numerous ways to provide opportunities for learning and collaboration through technology. Surprisingly, some innovations spearheaded by civic society and utilizing low-cost technologies were able to rapidly develop materials and adapt their methodology in a short time, forming a stark contrast against the long time it takes for educational bureaucracies to formulate and execute their plans. But to a certain extent, some educational innovations were able to fall rapidly into place because of higher authorities. Administrative authorities sought to uncover agility within regulations (e.g., relaxing procurement regulations or easing examination/ assessment standards), which facilitated collaborative efforts across different actors in the education ecosystem and helped overcome barriers that stalled innovative designs and practices.

Whether government agencies and educational institutes were able to quickly respond to demands for innovation to ensure learning continuity during school closures often depended on building relationships with other partners and leveraging existing advantages. While some innovations were entirely new models, most innovations were new ideas, not yet mainstream, built upon existing infrastructures and frameworks. Consistent investments in education infrastructure, knowledge innovation, and partnerships may not yield immediate results but can nonetheless strengthen an education system's resiliency and wield important impacts in critical moments, becoming an advantage for education transformation.


## 3 Digital education and data analysis warrant further investments and implementation

In many aspects, educational innovations during the pandemic represented the world's largest experiment in digital education and showed the importance of digital resources and tools. Many countries were clearly lacking in infrastructure for digital learning and there existed a substantial gap in teachers' and students' tech knowledge and skills, both of which could enable them to effectively use technology. Thus, international cooperation, public investments, and smart decisions are required to accelerate and capitalize on the potential of digital education.

In emergency situations, many innovations were formed in haste and inadvertently resulted in unprecedented information collection and intensive monitoring. Many educational innovations gathered data to investigate which areas performed well and which areas presented new demands. The information was also leveraged for quick feedback and continuous improvement to maintain learning continuity. Such systematic surveys coupled with information exchanges gave rise to evidence-based decision-making and should be continued in the future. To confirm the impact of the crisis and resulting innovations on students' learning opportunities, academic progress, and emotional/ physical development, government agencies should invest in rigorous data collection, strengthen their abilities to collect information and analyze evidence in education, and record students', teachers', and families' experiences to help arrive at smarter decisions.

## 4 Educational innovation is the starting point of education transformation

During the pandemic, education actors worked together to develop many new ways to maintain education. Their efforts, though

faced with challenges, are important not only because the innovations provide learning opportunities in an extreme time but, more importantly, present many new possibilities for rebuilding education. Yet, many of these education innovations, though great, do not have an internal mechanism for sustainable development. For example, some private companies provided resources at low costs or for free during the crisis, which helped build alternative forms of education, but this type of contribution in the form of sharing education resources may dwindle as the crisis eases. Other examples include educational innovations that support students to develop self-regulation skills by providing a wealth of courses and resources, allowing students to choose when to learn and what to learn at their discretion. Such innovations where students are expected to control their own progress and pace are easily achievable when accountability is deprioritized, but when schools bring back examinations and assessments or return to content-centric education models, these innovations will find it difficult to yield outcomes.

The crisis has subverted norms and broken barriers, which may be an opportunity to redefine the roles of learners, teachers, parents, communities, governments, private organizations, and other partners, opening up new possibilities for how the roles intersect and collaborate. Innovative collaborations become popular in the face of pressing crises; governments become more open to new ideas and partners. But, unsurprisingly, as the crisis abates, some norms, bureaucratic barriers, and education actors' mentalities regarding their roles may be reinstated. Innovative collaborations that were welcomed during the crisis may face opposition in the post-pandemic era.

As such, educational innovation and systemic education transformation are not the same. Educational innovation is finding an opening in the education system in a time of crisis and is more akin to extensions or add-ons. The goal of such opportunistic innovation is not to connect with other operational parts of the education system or to change how the education system works. Therefore, educational innovation may not necessarily yield systemic education transformation.

Though educational innovation is not an intervention that can change how the education system operates, it can be a starting point for education transformation and has the potential to contribute to the process. In the post-pandemic era, outcomes achieved from educational innovation will undergo review, facilitating the conversation for education transformation. We need to evaluate the

outcomes and sustainability of educational innovations implemented during the pandemic. We must learn from the experience to integrate promising innovations with regular school structures, roles, and processes to roll out systemic education transformation.

In conclusion, the COVID-19 pandemic has had an immense impact on schools and education systems. Most of the impacts were negative but if we actively seek positive effects, we can learn more about how educational innovations were able to yield results in the face of major challenges. If we fail to learn from this experience, we may simply return to old and established practices from before the pandemic. Though many of these educational innovations are imperfect, using technology to support remote education is something that can inspire the integration of digital tools into education. Reflecting on the experiences acquired from the crisis can help us promote necessary education transformations in stronger ways to rebuild a better education system. Education transformation in the post-pandemic era is not only important for recovering education losses from the crisis but also invaluable for helping students build the necessary skills for learning and creating a better, more sustainable, and equitable future.

# Chapter IV

## Global Education Transformation

夫水之積也不厚，則其負大舟也無力。...。風之積也不厚，則其負大翼也無力。

《莊子．逍遙遊》

# Chapter IV Global Education Transformation

Though many countries have invested a wealth of resources in education technologies and online teaching in the past decade, the progress of educational digitalization is still quite slow. Resistance to reforms from frontline educators is widespread. Before the COVID-19 pandemic, most school systems around the world looked largely the same as they did in the 20th Century. Rapidly evolving technology has already transformed the landscapes of many industries and drastically changed the way we interact, acquire information, and receive entertainment, but it doesn't seem to have the same impact in educational settings. Edtech investments by governments in the past have largely focused on ICT infrastructure rather than how teachers or students were applying technologies for learning. Such investments and developments have already been disproved as having any positive impact on student learning or yielding better performance in students[88].

When the COVID-19 crisis brought schools to a close, an unprecedented global experiment on remote education brought positive and negative experiences. On one hand, learning outcomes from remote education are often worse than that of in-person instruction due to limited digital equipment, limited internet connectivity, and gaps in household environments and digital competencies, which further limits learning opportunities for children from disadvantaged households and exacerbates educational inequality. On the other hand, various forms of educational innovations prove that different learning and teaching practices are feasible, presenting numerous possibilities for how education can be rebuilt. To rebuild better education systems after the crisis, many countries expanded investments and continued to promote digitalization for education, even changing the internal mechanisms of how an education system operates to integrate and roll out effective and sustainable educational innovations.

In this chapter, we will be analyzing how two countries - South Korea and Estonia - overcame the COVID-19 crisis and how they continue to promote education transformation in the post-pandemic era. South Korea and Estonia represent two entirely different education systems from Asia and Europe, respectively, and could be invaluable as references for Taiwan.

Decades ago, South Korea was a poor country with low literacy rates. That the country was able to achieve an economic miracle within the short span of a generation is inextricably tied to South

Korea's education craze where degrees reign supreme and everyone strives to be at the top. South Korea has invested heavily in education. Now, the Asian country holds the highest rate of young adults with tertiary education among all OECD countries. South Korea has also remained one of the top-performing countries in the PISA survey for secondary students. The cost of such outstanding performances is the rising suicide rates as Korean students are known to suffer from incredibly high stress. The government intends to turn around this landscape and is currently actively proposing policies to push reforms in the education system.

Education in Estonia is another miracle story of a small country leaping onto the global stage. Interestingly enough, Estonia's education system is decentralized, completely different from South Korea's centralized model. This former Soviet nation is home to a small population of 1.33 million and the best education system in Europe. Despite the country's relatively low education expenses, in the PISA 2018 organized by OECD, 15-year-old Estonian students surpassed the globally recognized education paradigm - Finland, in reading, math, and science. Schools in Estonia are also the best at promoting equality and their students are the happiest among OECD nations. The school's education goals are not to make everyone happy but to unleash students' potential by challenging their spirits and thereby finding satisfaction in their lives. Only a few nations around the world, Estonia being amongst the rare few, have been able to ensure high levels of performance without comprising satisfaction levels. Even then, Estonia is not satisfied with its current achievement, which is why the country is now pushing for further education reforms.



## Section I The Great Transformation for the Future of Education in South Korea

South Korea's substantial investment in education is an important foundation for its economic growth and democratization. Between 2015 and 2020, South Korea continued to amend its curriculum and

implement a series of reforms for primary and secondary schools. The key is to transition from a knowledge-centric pedagogy to a student-centric learning orientation. During this time, the Korean government took a methodic approach to gradually develop the software and programming skills of secondary and primary students, laying the foundations for AI education. In November 2020, the South Korean Ministry of Education published the *Education Policy Direction and Core Tasks in the Age of Artificial Intelligence*. This document explains the three education policies: development of "emotional and creative talent," creation of an "individual learning environment," and implementation of a "warm intelligent policy." The core tasks of the policies are humanistic education, education fitting for the generation, and tech-integrated education. More specifically, the document proposes to gradually integrate the AI smart subject program into K-12 schools in the next four years. New subjects include software programming, the basic principles of AI, AI applications, and AI ethics[89].

In 2020, the South Korean Ministry of Education designated 34 upper secondary high schools to demonstrate the AI education model and launched 247 AI pilot schools. In 2021, South Korea increased its number of AI pilot schools to 500. These schools used block grants from the Ministry of Education to hire IT teachers, establish a team to research how to teach software programming, provide outside training to teachers, and strengthen their infrastructures. Schools converted roughly 15% of their classes into AI-based courses for three years and provided students opportunities to access basic AI education such as AI, software programming, big data analysis, etc.[90] Media interviews revealed that Songsan middle School in Hwaseong City, Gyeonggi Province gave students opportunities to test out drones and taught students about AI, IoT, big data, cloud computing, and other core technologies in the Fourth Industrial Revolution. Such activities inspired student interest in related software programming and vocational courses and also guided students to use a wealth of data to conduct self-directed learning at their own pace[91]. After the policy was instituted, South Korea has been actively developing AI-related course materials. The Ministry of Education also announced a program that will be training 5,000 AI teachers by 2024. It is estimated that by 2025, updated courses will be rolled out across the country and all K-12 schools will fully adopt AI education.

Currently, South Korea is further amending its curriculum, including reassessing students' core competencies to ensure that learners are able to adapt to future changes. South Korea is also planning to engage major stakeholders such as students, teachers,

parents, and local educational authorities (city/ provincial level) for curriculum amendment and establish a curriculum development governance system that encourages civic engagement[92]. In the post-pandemic era, South Korea is attempting to convert the crisis into an opportunity by pushing major reforms for the future of education. In 2022, the Ministry of Education published the *2021 Education in Korea* [93] , describing how schools are expanding their digital infrastructure, becoming Green Smart Schools of the Future, and providing innovative teaching practices and courses tailored for the future. New policies underscored South Korea's resolve to mitigate inequality in education and ensure that everyone can receive training in pioneering domains and unleash their full capacity and talents. Therefore, we are witnessing another "great leap" in South Korea's education on the foundation of inclusivity and innovation[94].

## Making the crisis an opportunity

On January 20, 2020, South Korea announced the country's first confirmed COVID-19 case. By March 1, 2020, the number of confirmed COVID-19 cases rose to more than 1,000. The crisis emerged before the start of the new semester (March 2) and quickly spiraled out of control. To contain the pandemic, schools closed for the month to ensure student safety. In April, South Korea started implementing remote learning, providing lessons over the internet and TV to ensure learning continuity.

Though South Korea has comprehensive IT infrastructures, inequality continues to exist, and part of that is due to differences in the socio-economic statuses of families. During the pandemic, education in South Korea faced four major challenges: 1. How to rapidly respond to school closures and facilitate remote learning to ensure children safety; 2. teachers did not receive sufficient training for the adaptive abilities required to prep and support online learning; 3. how to resolve problems with internet connectivity and accessibility quickly, especially for marginalized and disadvantaged students; 4. children safety and protection, e.g., higher risks to mental health and of internet abuse in students[95]. In the face of these challenges, the South Korean Ministry of Education established a systematic model, adopting various measures to ensure that online courses are able to be conducted reliably, schools can be relaunched seamlessly during the pandemic, and that double-income and disadvantaged families receive support in the form of emergency childcare services[96]. Table 4-1 gives a brief overview of measures adopted by South Korea to support education during COVID-19.

| Building a Systematic Disease Control System for Schools | Stable Operation of Online Classes | Seamless School Operation during COVID-19 | Student Safety and Emergency Childcare | Gradual Return to School | Educational, Social, and Psychological Recovery |
|---|---|---|---|---|---|
| •Strict in-school infection control measures<br>•Development of a low-density classroom model<br>•Close monitoring of people with symptoms | •Expanding Public Infrastructure<br>•Various Types of Online Classes<br>•Customized Support for Disadvantaged Students<br>•Enthusiasm and Commitment of Teachers<br>•Supporting Professional Development | •School Operation Guidelines<br>•Social Distancing and Density Criteria at Schools<br>•College Admissions Management during the Pandemic | •Emergency Childcare Support<br>•Stepping up Cooperation at the Pan-Governmental Level | •Preparing for a Phased Return to Normalcy<br>•Giving Teachers, School Workers, and Students Priority to COVID-19 Vaccinations | •Prepping to Remediate Learning Losses<br>•Supporting Psychological and Emotional Recovery in Disadvantaged Communities |

Source : *Ministry of Education (2021). 2020 Education in KOREA. Ministry of Education Publishing, Galmae-ro, Sejong, Republic of Korea*

Table 4-1 Measures Adopted by South Korea to Support Education During COVID-19

## Building a Systematic Disease Control System for Schools

The Ministry of Education listened to infection and epidemiology experts and quickly formulated the *Guidelines for COVID-19 Infection Prevention in Schools* and formed the School Reopening Support Team. The Team worked with the COVID-19 Emergency Response Team in each local education office. When a COVID-19 case was confirmed among students, faculty, or parents, they shared the information and took the necessary actions. Thanks to these efforts, Korean students have been able to start returning to school in May 2020.

During the pandemic, schools in South Korea implemented a COVID-19 Infection Control Model, which included: 1. Strict in-school measures for limiting community spread. The Ministry of Education offered an adequate supply of thermal imaging cameras, thermometers, hand sanitizers, and masks. Schools spaced out desks and installed screens in cafeterias for social distancing and regularly disinfected high-contact areas. 2. Development of a low-density classroom model. Students arrived at school and had breaks at different times and classrooms were divided into one or more classes or alternated online and offline classes to maintain social distancing in the classroom. 3. Close monitoring of people with symptoms. Before leaving home, all students and faculty members in Korea took an easy-to-administer self-health check and uploaded the results on a mobile app developed and distributed by the Ministry of Education. Only students and faculty members without any symptoms would be able to go to school. Anyone who comes in contact with a confirmed case must be tested. Anyone who is positive or identified as a close contact must be quarantined. Any student experiencing psychological stress could access counseling services provided by the Mental Health Support Team comprised of psychiatrists.

**Stable Operation of Online Classes**

Prior to the opening of online classes, the Ministry of Education began expanding public infrastructure to ensure all students could access online content successfully, including increasing Internet servers to the public Learning Management System (LMS) and renting out digital devices free of charge to students to overcome the digital divide. For lower-grade elementary school students who lacked digital skills, EBS (the national education broadcaster) increased channels and provided tailored learning according to grades. In addition, the Ministry of Education replaced outdated computers for teachers and increased Wi-Fi coverage in classrooms. To reduce the financial burden on families for wireless communication expenses, the government exempted mobile data charges until the end of 2020 and eased regulations on copyrights to facilitate the development of teaching materials.

Teachers were able to choose their preferred learning platforms according to their school's circumstances. Online classes could be real-time interactive classes or one-way classes where students could engage in content-oriented and/or task-oriented sessions. Content-oriented classes are pre-recorded video lectures, while task-oriented classes are when teachers assign tasks and monitor student progress. Schools can adopt other types of online classes depending on their

circumstances. Over 43% of schools used two or more types of classes.

The Ministry of Education provided customized support for disabled and multicultural students. Local education offices worked with local multicultural centers to translate parent notices into different languages and help multicultural students learn. For students with disabilities, the Online Platform for Students with Disabilities provided customized content for different types of disabilities. For those who were unable to participate in online learning due to disabilities, 1-on-1 or 1-on-2 face-to-face education (at home or school) was offered.

During the pandemic, the passion, professional commitment, and collective wisdom of frontline teachers in South Korea facilitated learning continuity and growth in students. They voluntarily joined teacher communities to share tips and ideas on online teaching. Less tech-savvy teachers made earnest efforts to strengthen their digital skills to provide quality online classes. From April 9, 2020 until April 21, 2020, around 2.3 million online learning materials were developed by teachers and uploaded onto public learning platforms.

To strengthen teachers' online class capacity, the Ministry of Education actively utilized 495 pilot schools for online education to select and share best practices in online teaching methods. The Ministry of Education has developed and is currently using online teacher communities such as "The Community of 10,000 Teachers," "School-On," and "Knowledge Spring (Jisik Saemteo)," to support teachers' online classes. Aside from encouraging voluntary capacity-building opportunities through online communities, the Ministry of Education recognized the benefits of offline teacher mentoring and trained 1,827 pioneering teachers and 300 instructors. These in-person or outreach consultations allowed teachers to learn the most effective techniques for producing online materials. Because of their proven benefit, the Ministry of Education has elevated the in-school teacher learning communities to a formal teacher training body to make funding and support more efficient.

### Seamless School Operation during COVID-19

To minimize learning losses during the extended COVID-19 crisis, the Ministry of Education reopened schools on May 20, 2020, and began providing a combination of both online and in-person instructions. The Ministry of Education announced a new *School Operation Plan* during COVID-19 to help schools take immediate action against learning problems caused by the COVID-19 crisis.

When schools are forced to close for more than 15 days due to COVID-19, they can adjust the days of summer and winter breaks and even reduce school days by 10% to compensate. Also, flexibility in documentation and assessment requirements for schools and teachers has been implemented to lessen the burden of managing their work schedules.

In 2020, the Ministry of Education postponed the College Scholastic Aptitude Test (CSAT) from November 19 to December 3 due to the pandemic. To ensure that all students could take the test in a safe environment, different plans to prevent the community spread of COVID-19 were established for test-takers classified as "Ordinary," "Under Self-isolation," and "Confirmed Cases" students. The Ministry of Education formulated examination plans for all classifications and increased the number of test rooms and supervisory staff. For ordinary test-takers, 4,318 more rooms and 30,410 supervisory staff were provided than the previous year. For students with symptoms and those under self-isolation, 7,855 rooms and 759 rooms were provided, respectively. One week before the test date, the Ministry of Education ordered all schools to switch to online learning to prevent test-takers from being exposed to the virus. To provide equal opportunities in applying for college admissions, the Ministry of Education changed the university admission screening period, reduced practical exams, and lowered the screening criteria (minimum CSAT scores).

### Student Safety and Emergency Childcare

Apart from the Ministry of Education, the government worked with the Ministry of Employment and Labor, the Ministry of Health and Welfare, and the Ministry of Gender Equality and Family to guarantee student safety. Parents with young children (eight years and younger or elementary school second graders) were recommended to work from home and can take advantage of 10 days of childcare leave from their jobs. Daycare services were also provided to dual-earner, low-income, and single-parent families. In May 2020, when daycare centers and community childcare services were closed, around 39.1% children and 4.8% elementary students benefitted from emergency childcare services.

### Gradual Return to School

Entering 2021, education policies in South Korea prioritized bringing back normal school lives. The first step was to increase student attendance and in-person activities. In January, the Ministry of Education announced the *2021 Curriculum Operations Plan* to help

schools operate flexibly within the density constraints of social distancing. Afterward, the *Step-by-Step Implementation Plan for Full Attendance of Kindergarten, and Primary/Secondary School for the Second Semester* (June 20) and *Direction of School Operations for the Second Semester* (August 9) were announced to preemptively expand school attendance for the recovery of emotional and psychological educational losses of students due to prolonged distance learning.

Around the start of the second semester, up to 60,000 testing personnel were employed to conduct intensive testing for four weeks. Teachers and school workers were on priority lists for COVID-19 vaccinations. As of September 17, the vaccination rate among education and childcare workers (kindergarten, primary/ lower secondary/ upper secondary schools, and daycare centers) was 94.8%. Children and adolescents were among the next to receive their first vaccination shots. These measures led to an average attendance of 82.1% in kindergartens, primary schools, lower secondary schools, and upper secondary schools. Starting from November 1, 2021, education in South Korea began returning to normalcy in stages: kindergartens, primary schools, lower secondary schools, and upper secondary schools returned to full attendance on November 22. According to data, the average attendance in 2020 was maintained at around 50%. In 2021, average attendance increased drastically to 73.1% in the fall semester and 86.7% in the spring semester.

### Educational, Social, and Psychological Recovery

The persisting pandemic negatively impacted students' learning and socio-emotional skills. The South Korean government conducted a comprehensive survey on learning, psychological, emotional, and health losses. The survey targeted all students and the results were used to formulate a recovery plan. Survey results showed that students' grades went down from the previous year. Factors impacting academic grades, such as satisfaction with school life, self-esteem, values, interest, and learning motivation, were also relatively lower. During school closures, stress, anxiety, and other issues relating to mental health began surfacing in students as well. Students reported that they found it difficult to make friends and adapt to school life, a negative impact that was especially prevalent in disadvantaged communities. As such, society became concerned that students would experience worsening socio-emotional skills.

In response, the South Korean government announced the *Comprehensive Education Recovery Plan* in July 2021 to provide

timely and comprehensive support for all students during the education recovery process; the central government worked with local governments and the Ministry of Education invested KRW800 billion. Students needing remediation learning programs could participate in Comprehensive Remediation Programs organized by their schools. The programs were held after school or during weekends/ holidays; teachers would provide additional support to a small group of 3 to 5 students. Upper secondary students struggling with learning due to learning losses can take personalized 1-on-1 sessions with their homeroom teacher. Schools with two co-teachers also offered additional services to struggling students. To increase students' grades, schools also founded groups to help students struggling with learning as a result of complex factors. Education agencies also organized learning clinics to provide consultation and support to students lagging behind in reading and math.

To help students recover from psychological and emotional losses, the government connected Wee Class (counseling offices in schools), Wee Centers (counseling centers in local education agencies), and external counseling services to provide free counseling and outreach services for disadvantaged communities requiring psychological and emotional help. In addition, the government strengthened student activities through student clubs and teacher-student tutoring programs, helped students recover social skills and physical health, and offered more sports activities at in-school sports centers. Schools also provided targeted support to pre-primary children, students in vocational schools, and other disadvantaged students. To increase attendance and prevent the risk of other epidemics, schools gradually added additional classrooms and temporary modularized classrooms to reduce class sizes and densities.

Response measures adopted by the South Korean government during the pandemic reflect the nation's passion for education and resolve to ensure that students continue learning and growing. The nation's disease control and preventive measures effectively protected students from infections. As the epidemic continues to evolve, agile teaching strategies, such as hybrid learning (including both online and offline), have become safe ways to provide education to students in South Korea. With schools adhering strictly to epidemic prevention measures, teachers and school workers receiving priority access to COVID-19 vaccines, and the Ministry of Education actively supporting flexible school operations, Korea was able to turn the crisis into an opportunity for change and gradually return to normalcy.

## Strengthen equal rights to education

Governments are the leading force for reforms in education systems. When assessing the equality of rights to education within a country, the people are in fact holding the government accountable. In the post-pandemic era, the Korean government remained devoted to public accountability in education. The government of South Korea spared no efforts to ensure that all students enjoy equal rights to education, from kindergarten to tertiary levels. In 2021, the South Korean government strengthened the education safety net to close the learning gap caused by COVID-19 and started fully funding high school education. The government also provided financial aid for education expenses incurred by K-12 students, tertiary students, and adult learners to reduce the financial burden of education on families. In addition, the South Korean government also designed policies to meet the needs of students from disadvantaged households, thereby, supporting their rights to education and the quality of the education they receive.

"Reinforcing the Public Accountability of Education" and "Educational Support for Disadvantaged Students" are the two major directives in South Korea's education reform (Table 4-2):

| Reinforcing the Public Accountability of Education | Educational Support for Disadvantaged Students |
|---|---|
| •Providing Quality Early Childhood Education and Childcare Services<br>•All-day Childcare System - Childcare Service in Elementary Schools<br>•Ensuring Basic Level of Education for All<br>•Free Primary, Lower Secondary, and Upper Secondary Education<br>•Establish Customized National Scholarship Program | •Facilitate Equality of Educational Opportunity and Reduce Education Expenses for Low-income Families<br>•Customized Educational Support for Disadvantaged Students<br>•Support for Students at Risk of Dropping Out |

Source : *Education in Korea (2021), published by the Ministry of Education.*

Table 4-2 Two Major Directives in South Korea's Education Reform

### Reinforcing the Public Accountability of Education

To strengthen national responsibility for pre-primary education, the government has launched the Nuri Curriculum, which integrated education from kindergartens and childcare from daycare services. The Nuri Curriculum also bridges into primary-level courses and provides quality early education and childcare services. In 2018, the government launched research to amend the Nuri Curriculum and started providing fully funded education for children aged three to five. To ensure fairness in kindergarten admissions, the Ministry of Education launched the Kindergarten Admissions Management System ("Go First School") to make online applications available and give priority enrollment to children from low-income families. In 2020, all national, public, and private kindergartens joined the Go First School system. In the same year, the government made it mandatory for public and private childcare to use the national EduFine accounting system in an attempt to tackle abuse of government funding in private kindergartens from the source. The EduFine accounting system has helped income and expenses in South Korean kindergartens become more open and transparent.

As part of the government's efforts to reinforce accountability for childcare services, the Ministry of Education closely works with schools and local governments to reduce the childcare burden for many families. In 2021, the government, working with local governments and schools, launched the School Childcare Center program to meet new childcare demands. Meanwhile, community-based childcare service is provided in libraries, public facilities in apartment units, and community youth centers to expand local childcare services as a means of meeting the rising demand for childcare services to satisfy the needs of both students and parents and provide all-day childcare services to students and parents. The after-school childcare service in elementary schools expanded to offer 3,500 classes by 2022.

To protect the health and safety of students, the Ministry of Education provides a 24-hour SMS/ Cyber Counseling Network to help students manage mental health problems. The Ministry of Education also collaborates with other agencies to provide metabolic syndrome screening tests for obese students, designate medical examination institutions for students with disabilities, and give free flu shots to elementary school students. In 2019, air purifiers were installed in all elementary, middle and high schools across the country to improve air quality in schools.

The Ministry of Education established a three-level safety net to prevent learning losses and help all students reach basic academic levels. The first level safety net is classroom support: two additional instructors intervene during regular class periods to help students with poor grades. The second level is school support: the government introduced the Do-Dream School program where a team comprised of a classroom teacher, a special education teacher, and a counselor provides customized support to those students who lag behind academically. In 2021, 5,193 schools have joined the Do-Dream School program. The third level is extracurricular support: to help students who suffered from learning losses due to complex factors and face difficulties that cannot be addressed at the school level, the government launched separate learning clinic centers. As of 2021, 140 clinics were operational across South Korea.

Also, the Ministry of Education introduced the Basic Academic Achievement Diagnosis and Intervention System to diagnose the cause of low academic performance and provide guidance on what a student should do both at school and home to make progress. In 2021, South Korea founded the National Basic Education Support Center to strengthen communication between the central government, local governments, and schools and help students with poor academic performances.

In Korea, high school education is not compulsory, but is de facto universal with a 99.7% admission rate for middle school graduates as the government has strengthened the publicness of primary, lower secondary, and upper secondary education and also reduced the burden of education on families. Starting in 2021, free tuition will be expanded to all grades of high school. This saves about KRW4.8 million for each student during the three years of high school education.

### Educational Support for Disadvantaged Students

To prevent disadvantaged students from being deprived of educational opportunities, the government not only provides support for their educational expenses, but is also committed to ensuring equal access to education (Table 4-3). In 2020, the Ministry of Education started distance learning in response to the COVID-19 pandemic. To support students with disabilities, South Korea set up the Online Classroom for Students with Disabilities Platform and uploaded 10,917 learning materials. The government also allocated a budget of KRW8.5 billion for the 2021 “Distance Learning Infrastructure for Students with Disabilities Program” to support the

expansion of its online platform, develop curricula, and create more experience-focused and engaging activities.

In Korea, students from families of different cultures can also receive customized education, including Korean language courses and mentoring, while students who defected from North Korea are eligible to receive systematic counseling to help them overcome psychological and emotional challenges. For students at risk of dropping out of school, the Ministry of Education provides a seven-week delay period that allows students to make better decisions for their future. During this period, students have the opportunity to access counseling and participate in customized courses, including job experiences and other art, sports, and cultural activites. Once schools identify at-risk students, they share the information with metropolitan and provincial education offices and community youth centers to help the students continue their education even if they are no longer at the compulsory education stage.

| Students with Disabilities | Students from Multicultural Families | Students who Defected from North Korea | Students at Risk of Dropping Out |
|---|---|---|---|
| •Online course for students with disabilities (10,917 materials uploaded)<br>•Remote education for students with disabilities (platforms, workshops, content, etc.) | •Offering more Korean language courses (404 courses in 2021)<br>•Disseminating the Multicultural and Receptive Education Model (713 schools in 2021) | •1:1 mentoring (1,210 persons in 2021)<br>•Offering professional counseling (64 sessions to 25 students in 2021) | •Developing School Dropout Prevention Plan (August 2020)<br>•Expanding pilot program for children that haven't received compulsory education or drop-outs (1,399 students registered in 2021) |

Source : Education in Korea (2021), published by the Ministry of Education.

Table 4-3 Educational Support for Disadvantaged Students

## The future of education in Korea

During the COVID-19 crisis, Korea witnesses a rise in innovative reforms for education. To capitalize on this opportunity to facilitate education transformation and re-imagine the future of education,

South Korea held forums to gather opinions and feedbacks from teachers, the public, experts, potential service users, and education stakeholders to help the government formulate visions, strategies, and the future of education in South Korea for the next few years.

In June 2021, the Ministry of Education assembled the Transformation for the Future of Education Committee led by the Minister of Education to unearth tasks for educational innovations to prepare the country for the future. The tasks include (1) the convergence of online and offline education tailored to the capacity building of each individual student, (2) utilizing digital technology to innovate education systems to achieve a more inclusive and sustainable education in the future, (3) expanding support for disadvantaged students to prevent education gaps from emerging, and (4) reforming teacher management systems to foster teachers to promote innovation.

With such strong momentum, Korea is now approaching closer than ever to the future landscape of education. School reforms in South Korea are as follows (Table 4-4):

| Career-Searching Education for Supporting Students' Growth | Digital-based Educational Innovation | Future-responding Revision of Teacher Training |
|---|---|---|
| •Consensus-based Revision of Curricula<br>•Operation of the Free Semester System for Middle Schools<br>•Implementation of the Credit System for High Schools<br>•Reinforced School–Village Education Communities<br>•Emphasis on Arts and Physical Education | •Learner-centered Digital Education Ecosystem<br>•Transition to AI Education<br>•Building Green-Smart Schools of the Future<br>•Ecological Transformation Education for Carbon Neutrality | •Changes to Teacher Training and Education System in New Environments<br>•Developing Teacher Competency and Expertise |

Source : Education in Korea (2021), published by the Ministry of Education.

Table 4-4 School Reforms in South Korea: Supporting Customized Student Growth

## Career-Searching Education for Supporting Students' Growth

The national curriculum is the basic design of education that presents the common and general principles of elementary and secondary education. Now, the government is preparing new curricula centered around the transformation for the future of education. What is remarkable is that curricula development is based not only on expert opinions but also public consensus. This process enhances the public's understanding and interest on future education, which is the catalyst for paradigm shifts in educational. New curricula aim at producing inclusive and creative leaders so they provide education for boosting capacity for responding the future changes, including the education of ecological transformation, democratic citizenship, AI, and digital knowledge. After the revised curricula are decided at the end of 2022, they will be applied to elementary schools starting in 2024 and to middle and high schools in 2025.

For middle school education, the Korean government started implementing the Free Semester System in 2016, and in 2018, allowed schools to have the option of implementing a year-long program for first graders of middle school. The Free Semester System provides different education programs and eliminates testing so that students can be freed from knowledge-focused competitive environment and engage in process-focused participatory classes. The Free Semester System aims to build students' creativity, character, and core competencies for the future. South Korea will continue to progress its Free Semester System so that students can develop their talents freely and explore the best paths for their future.

For high schools, South Korea is introducing a credit system to provide students with opportunities to take a variety of courses matching their talents and future careers. For courses that are difficult to open at one school, neighboring schools can collaborate to provide a joint course to ensure a wider choice of subjects. Under the high school credit system, students can choose courses that match their abilities and career paths, and when they complete the courses, they receive credits with which they can graduate. What is remarkable is that South Korea has developed a platform allowing students in remote areas to participate in various interactive online courses, meaning that students of small schools located on islands, rural regions, and mountainous areas, where access to education is limited, can take online courses they want online. As of 2021, 60% of all high schools are implementing the pilot operation of the credit system. Schools are undergoing changes, such as diversified subjects

related to students' career paths, smaller classes, personalized education for individual students, and classrooms that fit the credit system. By 2025, all schools will introduce the high school credit system, which will be the foundation for students to grow into self-regulated individuals.

As there is a greater social demand for advancing the educational strength of each region based on the cooperation of schools, villages and local communities, the development of future models for innovative schools and innovative educational zones that operate autonomously by each province and city is promoted. The goal of innovating schools is to innovate operations and curricula with the participation and cooperation of the education community. Based on the cumulative success of innovative schools, future models for innovative schools are being developed in line with specific regional contexts. Starting in 2020, sustainable cooperation systems were constructed in each region and future education zones have been designated to create special cooperative project models matching local characteristics to support the establishment of local education ecosystems.

In terms of mid-to-long-term policies, the Korean government encourages student participation in arts and physical education. The Ministry of Education launched the "one art per one student" policy, allowing students to select an art activity of their choice, ranging from orchestra, drama, musicals, fine art, traditional percussion music, and cinematography. The government collaborated with the related agencies to link local art resources with the school curriculum. For example, students can download an app connecting local art resources and external human resources (i.e. artists, art lecturers, volunteers).

To offer quality physical education, the government is pursuing diverse policies for the "one sport for one student" purpose by offering remote PE classes, launching survival swimming classes for elementary school students, expanding sports activities for female students, and offering career counseling for physical education majors. It also supports student-led sports activities, including school sports clubs and competitions. For student athletes who have to train and study at the same time, the government offers e-schools to guarantee their right to learn by providing them with compensatory learning opportunities for building basic academic skills.

## Digital-based Educational Innovation

To overcome the COVID-19 crisis, South Korea launched the Digital New Deal, which aims to create an education ecosystem powered by digital technology. The Korean government has reinforced its digital learning infrastructure by improving wireless network connections and providing teacher training in digital pedagogy. The government plans to install GiGA WiFi networks in 380,000 classrooms of elementary, middle, and high schools and develop digital textbooks and software-engineering education courses. Teachers are also being trained to be AI specialists. Every year since September 2020, about 1,000 in-service teachers are selected to take the master's degree course in graduate schools of education and turn into teachers specialized in AI convergence education.

Since 2007, South Korea has been developing and distributing digital textbooks and, starting in 2018, digital textbooks included VR and AR-related content, allowing students to engage in immersive learning simultaneously through tablets and VR devices. Currently, there are 134 digital textbooks in use, including social studies, science, and English for elementary school students (grades 3 to 6) and middle school students (grades 1 to 3) as well as English for high school students.

According to the *2015 Revised Curriculum* announced in September 2015, software education was introduced in some middle schools in 2018 and adopted by elementary schools starting in 2019. Currently, all elementary school students (grades 5 to 6) and middle school students nationwide have enjoyed over 17 and 34 hours of software education, respectively. The software-engineering education courses, 51-119 hours are offered to high school students as elective subjects.

The Korean government is currently promoting AI education and offering kindergarteners more chances to experience AI through play. In 2021, the government developed the AI Education Content Criteria for each class of elementary (play/ experience), middle (practical learning), and high schools (algorithm application), promoting AI-related courses using supplementary teaching materials. The first case of AI being used in school education is Math Explorers, a math support system for elementary school students. Since then, more and more AI technologies are being introduced in the field of education, such as an AI-based English speaking practice system for 3rd-6th grade students and Book Fruits, a reading support service that is used along with the "One Book per Semester" initiative.

In 2021, the Korean government designated ecological transformation education as one of the tasks to realize schools of the future and is supporting schools accordingly. Specifically, it focuses on the reinforcement of ecological transformation education for a sustainable society, the establishment of culture for the transition to a carbon-neutral society, and the preparation of protocols for responding to the Paris Agreement. As the *2022 Revised Curriculum* reflects the ecological transformation of education for a sustainable future, the courses for student and teacher training related to ecology will be enhanced. Related government agencies and offices of education also cooperate to establish pilot schools focusing on carbon neutrality, eco-school (environmental experience centers), and green schools, promoting an experience-centered education environment. To respond to the global climate change, the government revised the *Framework Act on Education* to lay the legal foundation for strengthening environmental education, and is working to amend the *Environmental Education Promotion Act* with relevant government agencies to revitalize environmental education in schools.

Based on AI education and ecological transformation education, the government launched the "Green Smart Schools of the Future Project," earmarking KRW18.5 trillion for school remodeling between 2021 and 2025 and turning 2,835 buildings older than 40 years into green smart buildings. The “Green Smart Schools of the Future Project” will build a smart learning environment, develop a school operation system, and promote education reforms. In addition to the basics of wireless internet and smart terminal devices, the project also contains a smart learning management system and education administrative information system, enabling the use of big data for customized learning diagnosis. It can also use smart monitoring, sensors, and other cutting-edge security technology to ensure school safety, such as using facial recognition technology for access control on campus and using behavioral analytics systems to prevent and monitor bullying and fires on campus. The “Green Smart Schools of the Future Project” aims to cultivate future leaders of the post-pandemic era and create future-oriented, eco-friendly school environments. The second phase of the project will be launched in 2026 and is estimated to create a total of 150,000 jobs and reduce 190,000t $CO_2$ of greenhouse gases every year. The ultimate goal is to create a ubiquitous environment in which learners can access a variety of learning experiences anytime, anywhere, as well as a low-carbon, eco-friendly learning environment based on sustainability.

## Future-responding Revision of Teacher Training

Teachers play an important role in helping students achieve personalized learning, and teacher training serves as the cornerstone of the development of Korean education. In a changing educational environment highlighted by distance learning, AI, big data, climate action, environmental response, and inclusive society, South Korea has established the Korea Education and Research Information Service (KERIS) as a professional institute to promote various education digitalization policies in South Korea. KERIS provides training programs aimed to strengthen teacher competency in course design and information usage. Training programs for teachers at the primary and secondary level include professional competency of instructing software education courses, competency of teachers applying and designing courses with digital textbooks, and AI teaching competency.

Teachers in Korea develop their competency continuously as lifelong learners through job training and qualification training programs. At different stages of their career, teachers undergo job training courses (face-to-face, remote, and hybrid) to enhance competencies in need, such as their expertise, understanding of students, and cooperation with local communities. In 2012, the Ministry of Education launched a mentorship training program, encouraging outstanding or experienced teachers to instruct new or inexperienced teachers and share their professional know-how in teaching. Schools can recommend teachers with more than 15 years of teaching experience to apply for the position, which consists of an extendable 4-year term. During their term as mentors, the Ministry of Education will reduce their teaching hours and subsidize research activities to assist them.

Currently, the Korean government is preparing a plan for an advanced teacher training system, aiming to improve teachers' adaptability, future confrontational ability, and multi-disciplinary skills, as well as the continuous advancement of their expertise. Moreover, starting in 2020, national colleges and universities of education are establishing future education centers to enhance the ability of distance teaching of prospective teachers, supporting the improvement of the curricula of teacher training institutions in their transition to future education.

## Section II Estonia Leads the Way in Digital Education

Estonia declared independence in 1918 and was then occupied by the Soviet Union in 1940. In 1991, Estonia was able to redeclare its independence from the Soviet Union. After its independence, Estonia opted to not rely on an expensive bureaucratic systems and instead asked the central government and local governments to share the burden of education governance. The government, parliament, and Ministry of Education and Research is responsible for spearheading educational policies; the latter is also additionally responsible for coordinating curricula development and budget allocation as well as coordinating stakeholders in the education domain to understand demands and formulate policies. Local schools at the elementary and secondary level are managed by local governments, and schools under local governments have a board of directors (hoolekogu) to coordinate collaboration between stakeholders and build an environment for learning and growth in schools.

Over the past few decades, the Ministry of Education and Research has strived to establish a joint public administration department to facilitate decentralized education management and find a balance between centralized and decentralized education governance. Estonia encourages students, parents, teachers, principals, administrators, scholars, policy makers, partners in society, and other stakeholders to act on their ideas and shape education policies in all aspects; local stakeholders generally adopt local and global experiences as they continue to strengthen their education systems. On average, Estonia invests more in pre-primary and primary education than the EU. There is a high level of trust in the education system; organizations, fiscal policies, and provision of education uphold the principles of "equality[97]."

Estonia first participated in the PISA in 2006 and has steadily increased student performance in reading, mathematics, and science as well as equality indexes throughout the years, even exceeding the OECD average. In PISA 2018, Estonia topped Finland in reading, mathematics, and science, ranking first in Europe. Performances of students from disadvantaged households also drastically exceeded the OECD average, attracting global attention[98]. The OECD has rated fundamental education in Estonia as one of the best in the world as Estonia is able to cultivate high-performing students with high life satisfaction levels while instituting a highly equitable system. This

education powerhouse gives its children a great start to their extraordinary lives.

To uncover the secrets to Estonia's success in education, many media outlets and education experts traveled to this Baltic nation. Children in Estonia begin elementary education at the age of 7 but are eligible to enter kindergartens at 18 months. School lunches, transportation to and from school, and textbooks are all provided free of charge. Estonia adopts mixed-ability classes, meaning that students are not sorted into fixed classes based on their abilities, and social exclusion is nearly unheard of. Most schools are staffed with psychologists and the country conducts a national happiness survey to assess the mental health of students and teachers. Entrepreneurship underpins the entire education system of Estonia. Schools enjoy high levels of autonomy and do not undergo regular inspections. The government evaluates schools once every three years through online examinations and only intervenes when problems emerge. In Estonia, children start learning robotics at the age of 7 and teachers use virtual reality to teach geography, chemistry, history, and languages. One of the secrets to Estonia's success in education is its use of technology; the government started investing early on to ensure that all schools are equipped with strong information equipment and internet services. Most students use online class schedules, tests are shifted online, and homework and school assessments are conducted digitally[99].

As a relatively nascent country, Estonia does not experience traditional dogma or resistance to reforms often found in other large nations. Estonia is the birthplace of Skype and is known for digitalization. Most nearly all public services are digitalized and the country believes that, to achieve progress, everyone needs to continue learning. After Estonia's independence, the youth generation integrated their beliefs in lifelong learning with equal-access technology to create a brand new education system, providing high quality education to all students, regardless of their backgrounds. Despite being a high performer on PISA, Estonia continues to feel that there is much more to be done. Classes are shifting away from "knowledge and comprehension" to "implementation, analysis, comprehensiveness, and evaluation," focusing mainly on problem-solving, critical thinking, values, civic identities, entrepreneurship, and digital competency. The pervasive feeling among leaders in education in Estonia is that much innovation is required to improve the quality of teaching and learning, as well as to enhance the well-being of all students and teachers to co-construct a future we need now[100].

## Passing the COVID-19 stress test

In spring of 2020, Estonia's education endured the stress test of COVID-19. Over the past two decades, Estonia's education system has remained committed to supporting schools create equitable learning environments, meet individual student needs, and support students with special education needs to explore their potential. As such, the Baltic country's education system is equipped with the important ability to operate under different circumstances and the flexibility to satisfy student needs. During the pandemic, schools quickly turned to online education and adapted to the new landscape. Estonian schools responded accordingly to the crisis, mainly because Estonia is equipped with critical tools and support such as school management platforms, digital resources, and teams of edtech experts, enabling educators to deploy resources that they are already familiar with. Though we are unable to derive a formula from Estonia's success story, there is still much to be learned from their experiences[101].

## Leading Remote Education

Estonia is one of the most digitalized societies in the world, including in the field of education. Over the years, Estonia's education has consistently prioritized digital competency and ICT infrastructure. For example, the “Tiger Leap Program” (Tiigirihüpe) was launched in 1997 and has since provided schools with computers and an online learning environment, enabling schools to lead the way in digitalization and related training. Even before the pandemic, students had, on average, access to 1.1 computers and 96.4% of schools had internet connectivity[102].

Most schools use a digital school management system (eKool) developed in 2002 on a daily basis while other schools use another platform called Stuudium. These digital management platforms bridge schools, families, and local governments, providing teachers various functions that enable them to record student attendance and grades, give out homework, and send messages and course content to parents. Parents can use these platforms to gain insight into what their children are learning, how they are progressing, and contact schools. The widespread use of such platforms facilitated interactions and communications during the pandemic.

Before the pandemic, schools in Estonia were already using digital learning materials (e.g., www.opiq.ee; www.foxacademy.ee). Some schools organized Digital Days and would conduct remote

education for a few days every year. The Ministry of Education and Research started supporting the digitalization of textbooks in 2015 and all subjects across grades 1-12 have at least one interactive digital textbook. When the pandemic forced schools to close, digital textbooks for elementary and middle school students were made available online for free. Soon after, digital learning materials for high school students and from major online stores were also opened up to teachers and students for free.

In addition, over half of the schools in Estonia are staffed with one edtech expert to help other teachers with digital resources while in some schools, that role is filled by tech-savvy teachers. Teacher training is also consistent in Estonia. Teachers in Estonia have high levels of digital competency and most teachers have received professional development training in digital education, which is one of the main reasons why Estonia's education system was able to tackle the COVID-19 crisis with such success. As such, when schools were forced to close due to the pandemic, Estonia was better fit for remote education than most other nations. Estonia's experience shows that the country's long-term efforts in integrating technology with education have already yielded outcomes.

**Emergency Response from the Government**

On March 16, 2020, schools in Estonia suspended in-person instructions. The Ministry of Education and Research strived to support schools without affecting their autonomy. They announced education-related guidelines, set up websites to share resources, provided recommendations for remote education, and offered health-related suggestions. The Ministry also worked with local governments to conduct surveys to confirm teaching and learning needs. Though schools responded well to the crisis, frontline educators still brought up many pressing issues such as teacher workload, stress on students and parents, support for students with special needs, website capacities, digital platforms, and learning materials.

During the crisis, education authorities were able to respond quickly thanks to HITSA and Innove, two licensed and experienced national agencies that provided regular online seminars for teachers, principals, and parents and established numerous Facebook groups to support remote education. HITSA has the capability and experience to help schools strengthen digital education, while Innove was authorized to provide suggestions to teachers and parents, supporting learning for students with special needs. The two agencies were later merged into Estonia's Education and Youth Board (Harno)

to optimize resource use, prevent overlapping services, and strengthen coordination across various education reform measures.

In the few months when schools were closed, HITSA worked closely with Estonia's edtech expert alliances to rapidly develop nearly 80 different courses and organize 66 online seminars on the digital environment. Estonia also offered a national hotline to support teachers on how to use digital tools during the crisis. In addition, they launched digital teacher break rooms so that teachers were able to share their feelings and provide emotional support.

To help students with special needs adapt to new learning models, Innove recommended teachers parse homework into structural micro-units and help students formulate learning plans to create more opportunities for students to receive feedback. Innove also provided counseling to students and parents and called parents that were unfamiliar with computers. In addition to online courses by special education teachers, language therapists and psychologists also provided online counseling sessions.

### Agile Response from Various Stakeholders

During the pandemic, public advocacy prompted many private companies to support schools by providing free products and services. Several companies donated computers equipped with applications required for remote education. Edtech companies provided various learning software for free during school closures. Local governments also provided free internet connection to students from disadvantaged households. The Ministry of Education and Research allocated an additional EUR100,000 for purchasing computers in December 2020, EUR300,000 in January 2021, and EUR500,000 in April 2021. The funds were provided by the Estonian Union for Child Welfare, an NGO dedicated to guaranteeing children rights and shaping a child-friendly society.

More importantly, administrative teams, teachers, students, and various organizations (e.g., Estonian Students Society and School in Motion) created various videos about how to teach remotely. The videos cover a wide range of age groups and topics, including suggestions on how schools can shift to remote education. Teachers compiled and shared a variety of learning materials and videos created by students on various platforms and provided a series of videos for remote learning, most of which had an interesting presentation. By autumn of 2020, the website e-koolikott.ee contained over 23,000 learning materials and provided digital

learning materials for students with special needs. By the end of 2020, the Education and Youth Board (Harno) drastically increased its cloud capacity to fully prepare for the rapidly expanding database of learning materials on various websites. To further incentivize teachers, the Ministry of Education and Research organized a digital learning material competition on e-koolikott.ee lasting from August 2020 to March 2021[103].

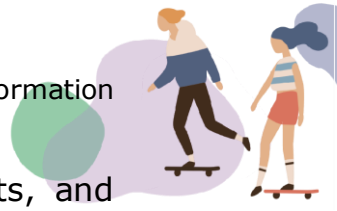
### Recovery Plan

Schools in Estonia returned partially to in-person instructions on May 17, 2020 (e.g., students with special needs and graduating students in 9th and 12th grades). In 2020, the Ministry of Education and Research canceled the graduation exam for 9th graders and high school graduation exams became voluntary instead of mandatory. Students who were unable to attend the spring exam could opt to take the 2020 fall exam. In December 2020 and the spring of 2021, lockdown measures impacted schools yet again. The Estonian government, however, believed that young children and graduating students should continue to receive in-person instructions. Students with special needs, struggling families, or requiring additional support were also allowed to continue their education in person. With prior experience, schools and students were quite prepared for blended learning. In spring of 2021, surveys from the Ministry of Education and Research revealed that principals generally agree that teacher competency in using digital teaching to support student learning has drastically improved.

Estonia also deeply values extracurricular learning. To encourage students to take part in extracurricular activities and short-term camps after lockdowns, the Ministry of Education and Research provided additional funding to local governments and youth centers to fund summer activities. The Ministry of Education and Research also launched a COVID-19 Recovery Plan to fund schools and help recover learning losses incurred during school closures. The Plan also adopts special measures for schools that have fallen on hard times, introduces college students as tutors, provides an emotional support hotline for students, brings in more psychologists to school systems, and develops MOOCs en masse to support teachers and parents.

### Education Satisfaction Survey & Research

Estonia started conducting a series of surveys in 2018 to balance satisfaction levels in the country's education system across different stakeholders. The survey covered various levels throughout the education system, from pre-primary and high school to vocational



education, and gathered information from students, parents, and teachers regarding school environments, student learning, and student happiness levels. After the survey, schools receive a report summarizing results across different stakeholders and comparing these results to national averages.

Estonia also collected feedback on remote education and emergency response from stakeholders starting as early as the first week of school closures. They sought to learn more about teachers' remote education experiences to help formulate suggestions for remote learning. Later on, the Ministry of Education and Research and Tallinn University conducted broader research into remote education, using qualitative case studies to conduct national surveys targeting students, teachers, parents, and principals and providing long-term suggestions for school development and learning organizations.

Current research reveals that most teachers, parents, and students in Estonia are quite optimistic about remote education. Yet research also reveals that the wealth of digital platforms has left teachers, students, and parents feeling overwhelmed, forcing them to reduce course content and channel their limited energy to students' socio-emotional skills. The primary challenges for Estonia when it comes to remote education seem to be teacher workloads, student stress, lack of resilience, and learning motivations[104].

For example, one research surveyed how 10- to 18-year-old students in Estonia responded to remote education during the pandemic[105]. The report showed that most students (97%) had the ability to engage in remote education but 14% of students still needed to borrow tablets or computers from their schools. In addition, 43% of students expressed that they found it harder to ask for teacher's help during online courses than in class. Around 50% of students reported homework being harder, having fewer physical activities, and bullying still existing online, but 50% of students also believe remote education to be more efficient, happy, and calm. During school closures, Estonia witnessed a rise in student independence and autonomy levels; 80% of students reported feeling safer during remote education and 70% of students reported acquiring new learning approaches. Though one-third of students started to tire of remote education, 90% of students were still satisfied with digital learning.

To further understand how schools handled remote education, the Ministry of Education and Research commissioned Tallinn University to conduct survey research. The research compiled the

views of principals, teachers, students, and parents and arrived at a critical conclusion: the key to successful remote learning is effective management throughout the entire process[106].

To be exact, in terms of self-management, the most successful schools designated certain platforms and provided user manuals for these platforms to prevent students from feeling overwhelmed by too many options. Teacher satisfaction with remote education was higher in schools that held regular meetings, helped teachers solve problems, assisted with coordinating, and made ICT experts accessible. Effective management can help ensure that teachers, students, and parents are getting the support they need.

Student learning progresses when teachers invite students to join in the planning process and support student self-regulation, e.g., plan their work and self-monitor their own progress. Students with special needs can benefit more from 1-on-1 classes, collaboration between students, and collaboration between students and experts.

Entrepreneurship underpins the management of Estonia's education system and is the key to the country's successful journey through the COVID-19 stress test without prior planning. The case study from Estonia reveals that collaboration and co-creation from various stakeholders are necessary. Communication channels used by schools to ensure information sharing can often mitigate stress from the crisis. When using digital technologies, the teaching and assessment focus of teachers is usually on the process and subject integration. Helping students plan their learning and facilitate self-regulation is also critical. During times of remote education, parents and students require support and counseling, human interaction is therefore more important. In these situations, teachers have to guide parents and strengthen collaboration with parents. Learning materials or tools that are too complex will be set aside; time is a deciding factor. Though the digital world provides many solutions, less is more and it is therefore more effective to allow schools to leverage their entrepreneurship and opt for their own digital solutions so that they can deploy fast, easy, and familiar solutions.

Estonia paved the digital foundation for remote education before the pandemic and proved that hybrid learning is viable. Education satisfaction surveys have urged Estonia to cultivate a more effective digital learning environment, design innovative pedagogies and learning analytics, accelerate digital competency acquisition, and strengthen collaboration and communication across stakeholders.

## Emphasis on equity and improvement

Estonia has established an ecosystem to facilitate stakeholder collaboration and professionalism, co-creating an equitable education system to satisfy individual, local, and national needs. The goal of education in Estonia is to achieve highly equitable and inclusive education, autonomy in learners, and professionalism, autonomy, and responsibility in teachers and school leaders. Despite being touted as a highly equitable and high-performing education system, Estonia believes it can do more. The pervasive feeling among leaders in education in Estonia is that much more work is required to support student learning, development, and happiness. The emphasis on equity and improvement is the driver for continued innovation in Estonia's education ecosystem.

### Supporting Comprehensive Growth & Happiness in Every Student

In addition to stakeholder engagement, two core values that continue to push forth education policies and practices in Estonia are equity and happiness. In education policies and public narratives, the government excludes elitist narratives to prevent formulating seemingly attractive but elitist measures as equality is heavily emphasized. Estonia supports equality and inclusion and treats equality from the perspectives of race, gender, talent, regions, immigrants, socio-economic needs, and special needs.

Social policies to support equality in Estonia include parental leave for new parents, one is eligible for 18 months of parental leave, while the other is eligible for a paid leave of 30 working days, meaning that at least one parent will be a full-time parent to their newborns for the first 18 months, a critical time period. Good parenting at early stages can help children with self-regulation and collaboration and can also enhance performances in schools. Providing low-cost and high-quality pre-primary education to students aged between 1.5 and 6 years old is also an important measure providing equal education to children from disadvantaged households. Estonia has decided to provide more funding to pre-primary and primary education than the OECD average, ensuring that students can enjoy free lunches; free and unfettered access to language therapists, psychologists, and social educators so they receive the necessary support and learning assistance for overcoming their challenges; development dialogue that increases happiness levels; and a series of free extracurricular activities that are not only beneficial to social and cognitive development but also a testimony

to the country's commitment to providing a beautiful start to a wonderful.

Taking care of policy, funding, support measures, standards, public relations, research, teacher training and practices, and professional development and management of school teachers is key to creating an equitable education system and ensuring that the education system operates effectively. Looking into the future, the Ministry of Education and Research hopes to conduct more research and adopt measures to integrate formal and informal education so that students have more learning opportunities. Priorities in their current education strategy also include strengthening inclusivity for low-performing male students and schools and increasing learning satisfaction in students[107].

### Using Assessments & Surveys as Tools to Improve Learning

Research and program monitoring are critical to informed decisions and planning. The long-term strategy of Estonia's Ministry of Education and Research is to facilitate empirical-based evaluations, assessments, decisions, and plans by collecting and quickly providing reliable and relevant data so as to subsequently build an organizational culture that uses assessments to serve learning. The public can easily access data on any school through central platforms. Such highly transparent systems provide insight to stakeholders and enable educational institutes to undertake more responsibilities. Local and national administrators can make empirical-based decisions by referring to relevant data and expand dialogue with stakeholders and future plans on the foundation of facts and empirical data, thereby preventing education from being overly political[108].

Estonia has been able to lead the way in education by emphasizing legislation and planning, upholding equity in education, expanding school and teacher autonomy, and making great strides in strengthening the digital competency of teachers, committing to inclusive education, and increasing teacher salaries. Looking into the future, as school assessments, student assessments, and the education ecosystem becomes interwoven, Estonia not only has to continue perfecting existing tools and practices but also seek to help critical stakeholders in the system build data literacy to improve existing practice and encourage, support, and manage future reforms. We should continue to look at how Estonia prepares to tackle these challenges.

## The future of education in Estonia

Since declaring its independence, Estonia has, on one hand, actively strived to establish a regulatory system for education and, on the other hand, adopted a long-term education development strategy. With support from regulations and guidance from long-term education plans, Estonia has been able to consistently increase equity in education while ensuring the autonomy of local governments, public schools at all levels, and teachers.

In Estonia, the central government formulates school systems, plans policies, and confirms principles for education budgets, oversight, and assessments. Pre-primary and fundamental education is managed and operated by local governments but the majority of decisions are made at the school level. When governing school systems, the Ministry of Education and Research seeks to facilitate decentralized management, finding a balance between centralized and decentralized powers. Local governments, principals, and teachers are given substantial freedom and responsibilities and must seek to fulfill national curriculum targets. Local governments manage schools in their jurisdiction but schools are given high levels of autonomy, including the freedom to decide their own curriculum and hire/ fire faculty or staff. On the other hand, teachers are able to decide how they teach and the materials they use.

Stakeholder participation is a strong pillar supporting educational reforms in Estonia. Local and international stakeholders have discovered many problems and opportunities in education and are assisting to uncover solutions. The Ministry of Education and Research has done much to incentivize stakeholder initiatives and are working with a wide range of stakeholders and across agencies to formulate practical and viable education plans, which will be conducive to education transformations, whether through digitalization, development of bilingual education, student happiness, or encouraging value education. These education plans provide long-term support to prevent impacts from transitions of political powers[109].

### Stakeholder Participation

In Estonia, stakeholders play an important role in shaping education systems. For example, the Estonia Education Forum (Eesti Haridusfoorum) invites a wide range of stakeholders to participate in discussions on education policies and urges and facilitates curriculum reforms. Another important organization is the Estonia Cooperation

Assembly (Eesti Koostöö Kogu), a foundation funded by national budgets aimed to reach consensus and provide evaluations and suggestions on modernizing public administration, spotlighting the health of their democracy, and developing effective partnerships between NGOs. Other stakeholders include the Association of Estonian Cities and Municipalities, principal associations, teacher unions, educator unions, teacher networks, parent associations, student associations, private school associations, associations of teachers in specific subjects (e.g., math teacher associations and geography teacher associations), and other professional institutes. Universities and colleges of education as well as international stakeholders also play an important role and have made many contributions to educational reforms.

Over the past few decades, stakeholder groups with foresight, resolve, persistence, and collaborative abilities have generated new ideas and launched programs of various sizes, leaving profound impacts on the development of education systems. For example, the Tiger Leap Program and subsequent developments can help facilitate digitalization in education and even society as a whole. The grassroots initiative of the Estonian language immersive program, originally launched in Russian schools, was later adopted by the education system and has become an integral part of closing the education gap between students of different cultural backgrounds.

Progressive reform is difficult to implement but Estonia is home to many educational innovation programs that are continuing to evolve. For example, the "Sports School Program" (Liikuma Kutsuv Kool) supports integrating sports activities into school life, making students more active in class and during breaks so that sports can become a part of the school's culture. "Interesting School" (Huvitav Kool) advocates for students, parents, teachers, and other education stakeholders to work together and create a rich and motivating learning environment that can facilitate more stimulating and inspiring learning and increase happiness levels in education stakeholders. Lastly, "Success and Action" (Edu ja Tegu) is an education program targeting entrepreneurship and careers that aims to give all students the opportunity to experience starting a business and cultivate their entrepreneurship.

Other innovative measures that continue to evolve include measures supporting educators to develop their own professional learning organizations; facilitating value-centric pedagogy to increase holistic growth and happiness levels in students; and strengthening digital competencies in teachers and students. These innovative

programs have a real positive impact on increasing student initiative, learning, and happiness. More importantly, they empower stakeholders, especially teachers, principals, scholars, and partners in society to work together to improve student learning[110].

Ultimately, teachers and principals are the primary agents for educational reforms. The force for strengthening education in Estonia originates, on one hand, from grassroots initiatives coupled with government funding and international aid that facilitates stakeholder engagement. On the other hand, governments also launched measures supporting stakeholder participation and encouraging initiatives, such as inspiring individual or collective reflection or actions, in teachers, school leaders, and other stakeholders. This helps generate mutual understanding between schools and society and makes education an issue that civic society can assist in developing.

### Long-term Education Plans

The Ministry of Education and Research has done much to promote grassroots initiatives and collaborate with stakeholder groups. To help stakeholders reach a consensus on broad education strategies, the Ministry of Education and Research has started formulating education strategies based on empirical research. "Estonian Lifelong Learning Strategy 2020" is an example of an innovative and unifying education development plan[111]. The draft for this Strategy was first proposed in 2012 and completed in 2014. It covers the vision for education system strategies and reforms from 2014 to 2020. The "Estonian Lifelong Learning Strategy 2020" aims to provide learning opportunities applicable to the needs and abilities throughout the life cycle of everyone in Estonia so that they can fully capitalize on opportunities in society, work, and family life to achieve self-fulfillment with dignity. The long-term education strategy has five strategic goals: 1. change in the approach to learning; 2. competent and motivated teachers and school leadership; 3. concordance of lifelong learning opportunities with the needs of the labor market; 4. a digital focus in lifelong learning; and 5. equal opportunities and increased participation in lifelong learning.

In 2021, to maintain sustainable and quality education development and ensure that education strategy priorities endure through transitions of political power in the post-pandemic era, Estonia set forth its main education targets for the next 15 years in "Education Strategy 2021-2035[112]." The general objective of the strategy is to equip the population of Estonia with the knowledge, skills, and attitudes that prepare people to fulfill their potential in

their personal, occupational and social life and contribute to promoting quality of life in Estonia as well as global sustainable development. The "Education Strategy 2021-2035" is the follow-up to the "Estonian Lifelong Learning Strategy 2020" and both documents will contain some similar targets.

To achieve the general objective, the strategy sets out three strategic goals, which are expected to achieve the following outcomes in the next 15 years: 1. learning opportunities are diverse and accessible and the education system enables smooth transitions between different levels and types of education. 2. In Estonia, there are competent and motivated teachers and school heads, a diverse learning environment and learner-centered education. 3. Learning options are responsive to the development needs of society and the labor market. Action trajectories and essential actions have been set forth for each of the three strategic goals and are expected to achieve a set of indicators (Table 4-5).

| Item | Learning opportunities and the organization of education | Teachers, learning environments, and approaches to learning | Education, society, and the labor market |
|---|---|---|---|
| Strategic Goals | 1. Learning opportunities are diverse and accessible and the education system enables smooth transitions between different levels and types of education. | 2. In Estonia, there are competent and motivated teachers and school heads, a diverse learning environment and learner-centered education. | 3. Learning options are responsive to the development needs of society and the labor market. |
| Action Trajectories | 1.1 Ensuring an inclusive and sustainable network and infrastructure of educational institutions providing high-quality education to ensure access to education for different target groups and a learning environment that supports contemporary approaches to learning and teaching.<br><br>1.2 Ensuring flexible learning opportunities, accessibility of high- | 2.1 Implementation of contemporary approaches to learning and teaching.<br><br>2.2 Curriculum development based on the principles of contemporary approaches to teaching and learning and the development of smart learning resources and methodology.<br><br>2.3 Promoting the development of a shared space of culture and values, ensuring high-quality Estonian-language | 3.1 Developing and implementing a sustainable system of forecasting and monitoring labor and skills needs.<br><br>3.2 Supporting the development of competencies that create more added value; improving continuing training and retraining opportunities. |

| | | | |
|---|---|---|---|
| | quality education, and supported learning to reduce drop-out and early school-leaving rates and to exploit every individual's potential to the fullest.<br><br>1.3 Promoting internationalization and learning mobility in order to diversify learning opportunities, improve the quality of education and promote wider awareness of the Estonian language and culture. | instruction and learning of Estonian.<br><br>2.4 Ensuring that the next generation of qualified school and university teachers and support specialists have flexible opportunities to enter the profession.<br><br>2.5 Ensuring a new generation of heads of schools and supporting their professional development. | |
| Indicators | • Increase participation of children from 3 years old to school age in pre-primary education from 91.1% in 2019 to 95%.<br><br>• Increase the share of 20 to 24-year-olds with at least secondary education from 84.8% in 2019 to 90%.<br><br>• Increase the share of 25 to 34-year-olds with tertiary education attainment from 40.8% in 2020 to 45%.<br><br>• Increase the share of holders of bachelor's and master's degrees who have participated in short-term learning mobility from 8.3% in 2020 to 15%. | • Increase the percentage of 16-24-year-olds with digital skills above the basic level from 76.2% in 2019 to 90%.<br><br>• Increase the subjective well-being of participants in the education process<br><br>• Increase proficiency of Estonian as a second language among basic school graduates by increasing the percentage of those achieving at least B1 level from 67.8% in 2019 to 95%.<br><br>• Increase the percentage of graduates from teacher training who, after completing their training, worked as a teacher for five consecutive years from 54% in 2019 to 60%. | • Increase employment rates among 20 to 34-year-olds with professional education by 78% in 2019 to 85% one year after graduation and by 74% in 2019 to 80% five years after graduation.<br><br>• Increase digital competences above base level among 16 to 74-year-olds from 37% in 2019 to 60%.<br><br>• Increase the entrepreneurial activity of graduates. |

Source : *Estonia Ministry of Education*

Table 4-5 Strategic Goals, Action Trajectories, and Indicators in the "Education Strategy 2021-2035"

The "Education Strategy 2021-2035" was formulated by the Ministry of Education and Research based on the European Pillar of Social Rights, U.N. Sustainable Development Goals, the European

Green Deal, a shared EU vision of a European Education Area, broad-based empirical research and analysis, feedback and input gathered through public consultations and engagement events, and the results of the Estonian Lifelong Learning Strategy 2020 and its mid-term evaluation. The "Education Strategy 2021-2035" sets forth priorities in education, funding provisions, and the basis for formulating implementation plans. The implementation of the Education Strategy is coordinated by the Ministry of Education and Research and supported by a steering committee. The Steering Committee makes recommendations for the initiation, modification, and termination of programs to increase performances and responsibilities across all actors.

The "Education Strategy 2021-2035" aims to develop a learner-centered, flexible, and forward-looking education system to support people acquire the skills and knowledge required in a labor market shifting from changing economic structures and immigration and integration policies. In order to achieve these goals, the responsibilities and roles of all actors need to be clear. It is important for everyone to assume responsibility for the tasks they are best suited to perform, and to be willing to cooperate.

- Educators: Create a development-supportive, healthy, safe, and cooperative learning environment and organizational culture.
- School owners: Create conditions for the proper functioning of their schools and ensure the necessary resources to maintain their schools.
- Parents: Support minor learners, create conditions that are conducive to learning, and contribute to school life.
- Learners: Take responsibility for their education and make informed choices of their educational paths in order to acquire the knowledge, skills, and abilities that will allow them to fulfill their potential and succeed in life.
- Labor market participants: contribute actively to the development of a learning system that is relevant to labor market needs, and participate in the development of curricula related to their specific areas of activity. Employers take greater responsibility for the development of education and the skills of their employees, including the provision of work-based learning and work placement opportunities.

- Civil society: Act as an important partner of the state, local governments, and social partners, and participate in the strategic development of education.
- The government and local authorities: Ensure a wide range of high-quality learning opportunities, accessibility, and high-quality learning environments, including an optimal network of educational institutions.

In anticipation of upcoming challenges, Estonia acknowledges the wider role of education and understands the personal, cultural and societal value of education, which was also the starting point for the "Estonian Lifelong Learning Strategy 2020." The vision documents emphasize that, for individuals, education provides an opportunity to discover and develop their capacities and skills in order to become healthy and active members of society. Education helps to preserve culture, develop identity, and connect the past, present, and future. The societal value of education should be reflected in greater coherence, safety, flexibility, creativity, and the regenerative capacity of society, which enable individuals to cope with a rapidly changing world, including crisis situations.

In conclusion, education is a long-term investment. Through long-term planning and stakeholder participation, Estonia has become a shining example in the global education community but Estonia refuses to be complacent with its current success. The "Education Strategy 2021-2035" emphasizes overall, comprehensive, systematic, and result-oriented approaches. Equality is also critical to the program. This long-term education strategy serves an important role in achieving Estonia's national long-term development targets for 2035 (Table 4-6).

- Estonia’s people are smart, active, and care about their health
- Estonian society is caring, cooperation-minded, and open
- Estonian economy is strong, innovative, and responsible
- The living environment of Estonia takes into account everyone's needs, is safe, and of high quality
- Estonia is an innovative, trustworthy, and people-centered state.

Source : *Estonia Ministry of Education*

Table 4-6 Estonia 2035 Strategic Goals

## Section III Drivers for Transformation

With massive vaccination efforts, schools are now preparing to go back to "normalcy," but for students and teachers in some countries, "back to school" does not mean back to pre-pandemic schooling of the past. The impact of the COVID-19 pandemic on schools goes beyond the surface and inspired many sustainable educational innovations. COVID-19 dragged educators into a situation where they had to make something new from nothing and guided educators to reimagine the education system, generating a driving force to integrate educational innovations to achieve systemic education transformations in the post-pandemic era.

In the examples from South Korea and Estonia, this driving force for education transformations originates primarily from three macro levels. First, policy discourse about "future education" driven by governments during the pandemic is critical and can effectively help schools achieve systemic reforms in a time of uncertainty. Second, COVID-19 has imbued education communities with a sense of urgency to collectively revise school systems, empowering them to place themselves at the center of efforts to realize "future education." During the pandemic, the shared professional ideals of educators facilitated collaborative learning and knowledge innovation, which shaped ownership and entrepreneurship in regard to education reforms. Third, governments are committed to balancing centralized and decentralized education governance to effectively support organizational innovation to respond to crises and promote systemic education transformations.

### Policy discourse about "future education"

When COVID-19 made education transformation urgent, the Korean government effectively utilized the discourse of "future education" as a rationale for educators' prompt shift in instruction to online platforms. South Korea heavily publicized discourse such as green smart schools, digital education, AI education, ecological transformation education, etc., effectively using media tools and new school guidelines to disseminate discourse about "future education" and facilitated sense-giving in the policy process. The idea of engaging methods of "future education" led educators to accept this enforced change in the name of preparing students for their futures, which provided the necessary momentum for sustaining educational changes. This progressive strategy effectively facilitated collective reflection on the needs of future education through national policy

agendas, research projects, and daily news outlets and become a catalyst for continued reforms in schools.

Education transformations require more than technical solutions, it requires conviction, emotions, knowledge, and changing behaviors. Estonia's "Education Strategy 2021-2035" provides coherent information and sharing spaces, giving educators such as researchers, education leaders, teachers, and professional organizations a clear vision of what is required for the future of education. Various educators collectively reflect and conceive ideas about the future of education, identifying lacking content in the existing education model and implementing innovative practices to prove that they can effectively change pre-pandemic schooling and ultimately ensure sustained education transformations. The effective use of policy discourse by decision-makers at the top is the driving force for sustained education transformations in Korea and Estonia even after the pandemic.


## Shared professional ideals

During the worse of the pandemic, to remediate learning losses, close the inequality gap, and bring students back to education sites, teachers in Korea took the initiative and shared innovative materials on online/ offline teacher networks within and outside of their schools. They also shared materials on professional learning communities and learned digital teaching tips from each other. Together, teachers co-created the professionalism of educators. The Ministry of Education and local governments also supported collaboration among teachers through various measures, e.g., pausing teacher evaluations, providing funding for teacher development, and supporting professional learning communities to transform into formal teacher

training agencies. Of course, not all schools and teachers successfully implemented online and hybrid classes, but the shared norms and vision of Korea's teaching culture significantly helped build and shape educators' sense of ownership in making, leading, and sustaining changes in schools[113].

Estonia has long invested, through national and local policies, in supporting stakeholders in the education ecosystem as co-agents for education reforms and fostering shared professionalism. For example, the Estonian Education Forum, teacher associations, parent associations, student associations, and various stakeholder groups have made many contributions to promote education reforms. Through sometimes heated debates, these stakeholders deepen society's understanding of educational needs and ways to resolve these problems. They also gain more insight into the values and beliefs of participating in the democratic process. More importantly, these shared understandings and beliefs become engines for collaborative learning between stakeholders and shape the entrepreneurship of Estonian stakeholders who have spearheaded education transformations during the pandemic. South Korea and Estonia were able to galvanize a shared professional conviction among educators, which laid the necessary foundation for sustainable education transformation.

## Innovative organizational management

During the COVID-19 crisis, South Korea was able to provide timely guidelines and resources to schools in various regions and effectively support teachers through the crisis. On one hand, the country relied on centralized instructions and the hierarchical chain of bureaucracy to promote efficiency in epidemic prevention and remote education. On the other hand, Korea used networks and timely communication to support and maintain systemic education transformations. In recent years, the South Korean Ministry of Education used centralized guidance and resource provision to innovate organizational management and support schools' autonomy and freedom to make professional decisions, effectively increasing flexibility in school decisions so that schools can adopt different approaches based on local contexts. The use of close communication within this hierarchical administrative system was critical in enabling individuals at the local level to understand and quickly implement macro-level policy decisions that reflected their local needs. To cope with the uncertainty and lack of knowledge about COVID-19, districts

and schools actively utilized (in)formal networks both vertically and horizontally in virtual settings. Central policymakers used smartphone messenger apps instead of official documents or emails to conduct multiple surveys and listen to local voices. Local districts further utilized an anonymous group chat wherein teachers could express complaints and opinions so district officials could deliver teachers' needs to the Ministry of Education. Moreover, it was typical for educators to use multiple group chats to communicate with their grade teams, subject groups, and leadership teams across the region to interact at the school level. Combined with Korea's highly developed bureaucracy, this kind of technology-driven communication fostered timely and speedy communication among education professionals and institutions. It also stoked creativity in the development of policies during the crisis and promoted education transformations[114].

In Estonia, to encourage education stakeholders to participate actively and share responsibilities, the government is attempting to find a balance between centralized and decentralized powers. The centralized measures adopted by Estonia, e.g., developing assessment tools that can provide reliable data, are helpful for building a transparent and achievable vision so that educators understand their specific goals and how to achieve them. At the same time, Estonia has given teachers, principals, and local governments high levels of autonomy; schools can formulate education strategy plans and curricula complying with national standards, which is conducive to facilitating voluntary participation and shared agency. Stakeholders have the right to reassess learning demands and determine the best learning content and approach in the local context. The Estonian government understands how to convert macro visions into effective actions and is dedicated to finding a balance between centralized and distributed powers so that teachers, learners, and stakeholders and co-develop courses and promote digitalization in education; encouraging empirical-based thinking and decisions are the source of a profound and enduring drive for progress.



The COVID-19 pandemic has not only changed the core activities of the global education system and forced schools to create new teaching and systems to support student learning, but also brought opportunities for resolving necessary challenges (such as the widening learning gap) and promoting customized learning and democratic education. As the idiom goes, "the devil is in the details." South Korea and Estonia continue to pay attention to the details as they transform education in the post-pandemic era, using policy discourse, collaborative teaching cultures, and creativity in organizations to co-construct a better way of schooling. Their experiences can inspire and help educators in Taiwan reflect and gain insight into opportunities for education innovation during the crisis so as to continue creating and leading education transformation in the post-pandemic era to benefit all students.

# Chapter V

# Advantages & Challenges for Education Transformation in Taiwan

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# Chapter V Advantages & Challenges for Education Transformation in Taiwan

Since the outbreak of the COVID-19 pandemic, education in Taiwan shifted to partial or full remote education. To reduce the risk of cluster infections, the Ministry of Education launched the Class Suspension Standards of Campus Response to COVID-19 Epidemic on February 20, 2020. On March 15 of the same year, classes were suspended due to confirmed COVID-19 cases in students and, on March 20, the first school was closed due to COVID-19. In the early summer of 2021, Taiwan raised COVID-19 Alert to Level 3 throughout the entire country. On May 19 of the same year, all schools were closed across Taiwan for the first time in history. All students were to study remotely at home until the summer break. In May 2022, as Taiwan entered the stage of a large-scale pandemic, many counties and cities suspended in-person instruction starting from May 23 and adopted remote education instead.

As the pandemic continued to worsen in Taiwan, schools were forced to turn suddenly to remote education, which presented many challenges to Taiwan's education system despite several schools conducting school closure drills prior to actual school closures. Teachers, students, and parents were all impacted by school closures. Many schools and teachers were caught off guard and not fully prepared to transition from in-person instruction to remote and digital teaching. Some teachers lacked the necessary digital competency and were forced to prepare digital content and provide online lessons under immense stress. In addition, not all students were prepared to learn at home. Being separated from their teachers and peers, students had to find ways to stay motivated and adhere to class schedules. Most parents were forced to continue working, sometimes even remotely. All of sudden, parents were asked to bear heavy responsibilities in remote education and be more involved with their children's studies.

The adoption of partial and full remote education in Taiwan enabled us to analyze the pros, cons, and barriers of remote education and help us reconsider how education is provided, allowing us to learn from these experiences for the future of education. For insight into the challenges that teachers, students, and parents faced during remote education, we conducted interviews between June and August of 2022. We interviewed a total of 25 stakeholders of primary education (9 teachers, 7 students, and 9 parents). The interview aims to reach out to teachers, students, and parents of different backgrounds (including those in outlying islands, remote areas, disadvantaged families, skipped-generation families, or special educational backgrounds) and collect experiences and opinions from

these different perspectives. The information can then help us evaluate the existing remote education solution and reflect on education transformation in Taiwan. Interviews were mainly conducted through 1-on-1 online conferences and only a small percentage of interviewees were interviewed in person. In this chapter, we will be primarily sharing the findings from our interview and discussing the advantages of challenges of education transformation in Taiwan.

## Section I Analysis of Remote Education in Taiwan

In the past two years, Taiwan's strict epidemic control measures and class suspension standards provided an opportunity for a "natural experiment." The COVID-19 pandemic accelerated education digitalization and allowed us to observe teachers, students, and parents in the context of remote education and collect invaluable information about education transformation. We adopted a semi-structured interview guide to gathering experiences from 25 interviewees about **remote education materials**, **required competency**, **school work and progress assessment**, **educational inequality**, and **mental health** under this extreme context. Analyzing such experiences can help us reflect on the pros and cons of remote education and under what conditions can remote education complement in-person instruction to satisfy the educational demands of future learners.

### Remote Education Materials

Remote education in Taiwan is primarily conducted through online learning and complemented by public media. We have long graduated from the industrial age and entered into the age of the internet. Yet there exists a great gap between teacher, student, and parent understanding of digital learning environments. Digital learning has a lot of advantages. For example, digital learning can overcome geographical limitations and save commute time as students learn study, and review at their homes. There are still many flaws in digital learning, one of which is that it is difficult to maintain student attention. In fact, all interviewed students admitted that they found it difficult to concentrate during online lessons and that they or their peers sometimes engage in unrelated activities during these times. They may sometimes intentionally leave cameras off, watch YouTube, play games, or browse other web pages. In this context, research findings

revealed the following insights into the teacher, student, and parent understanding of remote education:

### Remote education inspires rethinking of teaching methods

Remote education goes beyond simply converting learning content into digital formats, it highlights the importance of reconsidering teaching methods. Teachers are discovering that remote education is drastically different from in-person instruction and that it is difficult to convert all content into digital materials or teach online the same way they would offline, especially in hands-on classes. They must continue to find better ways to overcome the challenges of remote education. This is a challenging task for teachers, but also something that could yield great outcomes. One curriculum and instruction section chief shared that: "you have to consider student vision during online learning and can't have full 40-minute lessons. So you will be passing on less knowledge and you are required to adjust the way you teach." The same curriculum and instruction section chief also stated that: "many of the teachers at our school sill reject remote learning. They don't believe that they need remote or tablet teaching. But do you know? If one of your subject teachers tries to teach a class with remote education, people start comparing, why is this teacher able to teach remotely but others can't?" As some teachers are rethinking and adjusting learning content, the sharing of great remote education content has also inspired many teachers that were forced to prepare digital content from square one to change the way they design their lessons.

### Centralized digital platform services can effectively reduce unnecessary cognitive loads for users

Remote education is still a new experience for many teachers and students. Respondents generally agree that they were shocked to hear that their schools would be suspended. Unprepared schools were immediately sent into a state of panic. Yet, the central government and local county/ city governments were able to gradually set up online teaching tools and platforms for front-line teachers so that teachers had more tools than simply Google Meet. For example, Edu Cloud and the Adaptive Learning website by the Ministry of Education, CooC Cloud by Taipei City, Parent-Teacher Platform by New Taipei City, Smart Learning Bar by Taoyuan City, and m3 Cloud by Hsinchu county. These digital learning service platforms integrate organizational, interactive, and teaching functions to provide teachers across Taiwan with tools for online teaching. One teacher stated that: "At New Taipei City, we have this fun attendance system that I think is quite adorable. Student names are converted to monster names and

then you can use the screen to add or deduct points from the class. The students can then see who got more points or who got deducted points, which is really fun for the students." Such centralized digital platforms can reduce unnecessary cognitive load produced from too many digital resources and provide teachers with more convenient digital teaching services.

### Teachers have benefited from remote learning strategies

Throughout partial and full remote education, teachers have attempted various teaching methods to make lessons fluid. Many teachers have proposed initiatives to share practical methods and experiences. One teacher shared: "these experiences are invaluable, but if you share your successful experiences with other teachers, some will think it is as simple as replicating others' successful experiences. I think the first step is from replicating people's success. Once you replicate people's success, you become more willing to do this." Communities or Facebook groups organized by teachers have been critical in supporting teaching innovation for education transformation as it inspires under-prepared teachers to improve their teaching practices, strengthen their knowledge base to help them face challenges, and develop new skills. Many driven teachers also upload videos to private platforms such as LearnMode, Junyi Academy, Cool English, Dr. Live, PaGamO, etc. Some teachers use online software tools, e.g., myViewboard, Canva, Kahoot, Jumble, Wordwall, and other interactive software to liven up virtual classrooms and pique student interest in learning. A teacher from a remote area shared that: "without the pandemic, it's really hard for us to learn about new information or apps. It is precisely because of the pandemic that we have come in contact with different things and we learn that there is software for different things. That there are interactive software and interactive whiteboards that can be applied to teaching."

### Remote education yields pros and cons to student learning

Students are impacted by remote education regardless of their academic achievement. One student shared: "I feel like my grades from in-person instruction are higher than grades from online teaching." Remote education is more distracting, often fails to provide immediate feedback, and does not provide hands-on practices. As such, remote education has yielded negative impacts on the academic performances of students. But another student shared: "When you don't know something in class, during in-person instructions, a lot of people will laugh at you." Remote education seems to have a more positive impact on introverted students. Learning in a familiar and quiet home environment

without peer pressure and being able to re-watch non-synchronous lessons (pre-recorded teaching videos) are possible explanations for why these students are performing better. A mother to a child with autism and ADHD told us: "there are pros and cons to remote education because we can see problems he faces when learning, problems that he cannot overcome himself. This enables us to intervene immediately and interact more closely with teachers. The cons are that he's not really used to these software programs and he becomes more prone to anxiety These children perform differently in different settings."

**Poor learning outcomes from synchronized online lessons for large classes**

Before the pandemic, during in-person instruction, teachers often separate classes into small groups to facilitate collaborative learning and hands-on learning: "I separate students into small groups for discussions and ask them to come up with answers. I get to see what the students are writing and their responses and you can immediately see and point out their questions." Yet, in remote education for a large group of students, "you're basically just lecturing and students lose focus a lot more" and "you're only reviewing things and so students are just not as interested." As teachers are unable to pay attention to every student like they would in physical classrooms, students reported that "I would raise my hand (using the 'raise hand' function) but never get called on," which is frustrating for students. Synchronized online lessons seem to be more suited for small groups as it allows students and teachers to communicate and exchange information better (e.g., correct practice questions, answer questions from students, raise questions about the lesson, and provide feedback to students).

**Remote education is the trend for the future but will not be able to completely replace in-person instruction**

During extreme circumstances, remote education or hybrid learning can be an effective solution to maintain that sense of belonging for teachers and students in their schools and ensure that students, forced out of schools for long periods due to diseases, can continue to access education: "I think that remote education is a change of sorts...bringing everyone into the information age a little bit faster. Everyone has their own device and being able to learn at any time or anywhere is a great thing." One parent shared: "In Taiwan's education system, the government provides a clear curriculum...but that limits you... students go into the classroom every day to learn fixed things and teachers spend most of their energy teaching things within this fixed scope and students spend the same amount of energy to learn this as well. But with the explosion of learning materials,

students that are able to access the largest quantity, most accurate, and most up-to-date information in the shortest amount of time will have the greatest advantage." Regardless, nearly all respondents maintain concerns and suspicions about learning outcomes from remote education. One parent shared: "Personally, I don't think learning outcomes are great. Students are too comfortable at home and so they are more relaxed and easily distracted. Teachers aren't able to follow how every student is doing because they really just can't see every single student and they are focusing on the teaching so I don't think students are able to learn that much." Remote education lacks the real interactions, complex sensory experiences, and nuanced attempts and interactions that in-person instruction provides. One teacher underscored: "we cannot abandon in-person instructions because it cannot be replaced by technology at all." Teachers believe that remote education only supplant in-person instructions under certain conditions, for example, synchronized learning in small group formats or individual support for students with special needs.

## Required competencies

During remote education, teachers, students, and parents are required to learn how to use information equipment and software tools fast and must be equipped with certain levels of digital competency. In addition, students are also required to foster social and emotional skills as well as self-regulation abilities to learn better from remote education. Teachers are required to know how to use software and hardware as well as handle social scenarios in a virtual setting. As such, teachers are not only required to have digital competency but also required to fully comprehend that remote education requires careful design and that it is important for them to strengthen their digital teaching competencies. When asked about the competencies required for remote education, teachers, students, and parents shared the following insights:

### Primary students lack digital competencies and teaching remotely will require more detailed instructions

Primary students lack the digital competencies required for learning remotely by themselves and most require further explanation or assistance from parents or other caretakers. One parent shared: "the teacher asked a question today and asked students to reply in chat but students just don't know how. They spend a lot of time simply typing." One teacher also stated that:

"though primary students are the touch-screen generation but they don't have strong digital competencies." Some teachers find it very challenging to teach students how to use tablets remotely: "if they lose their password or any other things, information, or settings, we have to teach them how to do it remotely but teaching them how to log in remotely is insanely difficult. They don't even know where certain letters are on the keyboard." One problem with remote education for young children is that they aren't equipped with the necessary digital capabilities yet. Teachers observe that even students that have taken related information technology courses are not able to apply digital competencies to their learning. "One IT course per week is not enough," as such, teachers sometimes use other classes to strengthen students' applied digital competency: "if we bring up figure in Chinese class, we try to dive deeper into this person's background and use iPads to teach them how to search, where to click, what are keywords, and what kind of webpages are what they are looking for. That's what we can start to train on a regular basis."

**Other than digital competency, students also need social and emotional skills to capitalize on remote education.**

Using ICT equipment for learning and leisure/ entertainment is very different for students. One parent spoke frankly, stating that: "their ability to use computers and ability to learn are two completely different things." Other than digital competency, students also need social and emotional skills, such as flexibility, adaptability, patience, and empathy to fully engage in remote education. One teacher shared: "I think there is one thing that is hard to change. During remote education, interactions are purely between students and teachers. Students are not interacting with other students." Some students may take advantage of the time between remote education lessons to open up another Google meet conference to talk but during synchronized online lessons, students may opt to turn off their cameras and mics. One student shared that he felt that he looked ugly on camera and prefers turning off his camera or using a photo instead.

**Fostering social skills in students is more challenging through remote education**

During remote education, socialization does not occur as naturally as it would if students were taking classes in person. As such, teachers are required to design activities that facilitate social and emotional development in students. Yet most teachers find that they are not equipped with the necessary competencies to cultivate social skills in students through remote education. One teacher, with some frustration, shared: "anything on the screen seems like a video. Even though YouTubers on YouTube act like

they're interacting with you, but you know that they aren't! You're just looking at him. That's kind of the same thing." One parent also echoed the sentiment, stating: "in classrooms, students trust each other. But they are now separated by their screens and you sense that it's quite different. It's an interesting phenomenon because there are lower levels of trust." Many students also reported that they didn't like remote education because it made them feel more lonely, indicating that developing social skills are critical during periods of remote education as it is a major factor contributing to academic achievements and student happiness.

**Self-regulation helps students learn better remotely**

Students generally reported that they experienced higher levels of freedom when learning remotely but students are also required to take on more responsibilities than they would if they were learning in person. They are now required to take responsibility for their learning. For example, one student explained why he enjoyed certain online lessons, stating: "teachers will sometimes give us the option to go online or stay offline for general classes or art classes." Some parents expressed deep concerns about these voluntary attendances and self-directed learnings: "I don't want to watch him or nag him all the time. My struggle is how close to watch him. The closer you watch him, the less is able to develop self-discipline and he becomes more reliant on people telling him what to do every step of the way." Some parents reported laxer learning attitudes in students, while others found that their children were less organized in their school work because they weren't going to after-school centers anymore. But some parents felt that not following a set framework can cultivate self-regulation in children: "he knows that if he doesn't do this, nobody will remind him, and then he might end up getting poor grades and nobody else will do anything about it. So then he gets anxious." Some parents also discovered that: "he has the ability to learn by himself. His dad was nagging him and so he started to look at Google maps and even take practice tests online. You can see that he's enjoying it because he sometimes shares what he learned." One teacher also reported that some students were becoming mature and self-driven: "I think that sense of maturity arises from being responsible for themselves during online lessons." Self-regulation is a personal skill required throughout the learning process. Students that did not previously receive support from families or schools with formulating personal learning plans and self-regulation will find it harder to learn remotely.

### Digital competency of teachers plays a critical role in remote education

Remote education requires teachers to learn how to use ICT equipment and online software tools. Yet digital competency ranges drastically across teachers. Some teachers must learn from the most basic operations, while others have previously received information technology training. One director shared: "I'm an administrator and so, to me, teachers are harder to deal with than students. For students, you just have to make sure the economically disadvantaged students have access to tablets and so as long as teachers are willing to bring more tablets into the classroom and instruct students on how to use them, I think we can overcome that part. The biggest question is if teachers have that mentality for change. If not and if teachers are not willing to act, it becomes very challenging for students." Many teachers said that the pandemic was an opportunity for them to pick up on digital teaching tools and that it prompted them to realize that they've been too complacent with their lives as teachers. "Now I attend professional development events and take information technology courses. It started with the school pushing us to learn. I also use M3. I haven't used Google Meet yet but I have looked into how it works. I've also looked into hybrid learning and what other teachers are doing or sharing." As information technology rapidly evolves many teachers are beginning to reflect on what they need to improve and using professional development activities to strengthen their digital competencies.

### Teachers must further develop digital teaching competencies for remote education

Though teachers believe that they have greatly strengthened their information technology competencies, they also admit that their progress in digital teaching competency is slow and overly reliant on existing online educational videos and platforms. One teacher shared: "Before, lessons would be forty minutes. Now, maybe I teach for twenty minutes and keep students for another twenty minutes and ask them to stay on until they finish their homework. You really have to simplify everything because our director told us that extreme measures are required for extreme times. You really can't expect incredible learning outcomes in your students." With remote education, it becomes difficult for teachers to assess how much time they should allocate for teaching or how much homework students require. Remote education is not just about diversifying the learning process by using digital technologies, teachers must also consider various factors applicable to remote education. Building teachers up to be able to

teach remotely can help them maintain learning motivation in their students and manage their time better as teachers.

### IT support is crucial when teaching remotely

Schools that lack IT support teams will result in teachers relying on digitally competent colleagues. One teacher expressed that they were under a lot of pressure: "there was this one time when I was about to start my lesson and my students were already online that another teacher told me that he was having trouble copying questions onto Kahoot. By the third phone call, I went over to help him and then had to rush back to start my lesson with my students already online." This model of teachers helping each other has played a critical role in remote education, but IT support cannot come in the form of asking colleagues when problems arise and creating more work for colleagues. Based on what we've seen from past remote education experiences, all schools should be equipped with full-time IT support teams.

## School Work and Progress Assessment

During the pandemic, the Ministry of Education announced that online lessons will be considered formal lessons, and schools were authorized to provide lessons, teachings, and assessments through diverse and flexible means. Regulations were also relaxed. Homework and assessing student progress are critical even when teaching remotely. Generally speaking, the goal of assessment is to understand what knowledge students have acquired, help students reach capability indicators, and summarize learning outcomes. Yet remote education has changed assessment approaches and providing students with real-time and accurate feedback has become a major challenge. This means that training teachers to use homework and assessments to support student learning is just as crucial as using digital assessment applications. The following are major findings regarding homework and assessments in remote education from our research:

### Monitoring student performances is challenging when teaching remotely

Regular monitoring by teachers in classrooms, such as asking students to concentrate, stopping students from talking, evaluating student understanding of tasks and homework, holdings tests, or preventing cheating are easy tasks when teaching in person but highly complex when teaching remotely. Teachers share: "we ask them to turn on the cameras but sometimes they just don't respond and don't care to response" because "it's really hard to monitor students that are lagging

behind," "we have to wait for parents to upload pictures of homework every day but there are always a lot of problems," and "sometimes the pictures are just very blurry." Many teachers try to communicate with parents to ask for help with ensuring students attend online courses and turn in homework. But not all parents are accommodating: "sometimes they (parents) are annoyed that you're calling them" and "even if you want to talk to them, they won't respond." Some parents also expressed frustration: "children are just not as compliant at home. When you tell them to do homework or read, they just don't really hard."

**Delayed feedback can impact students' learning experience**

Despite teachers employing various channels to ensure learning continuity, providing real-time and targeted feedback is still a huge challenge in remote education. For many students, learning quality is impacted because of poor communication in classrooms, not being able to ask teacher questions privately without the presence of other classmates, and not receiving immediate feedback for homework. One student shared that he was dissatisfied with online lessons because "sometimes I raise my hand (using the 'raise hand' function) but the teacher just doesn't see it." Some teachers ask students to upload pictures of their homework but do not grade the homework or ask students to make corrections in time. One parent shared: "I honestly don't have the courage to ask teachers to grade their papers because I know it works for them too." Some teachers decide to adopt a more traditional approach: "many of the older teachers will put out two long tables and ask parents to turn in their children's homework on the table every day. The teachers then put back the graded homework on the table. They do that every day but don’t do anything if students fail to turn in their homework." Other teachers decide to provide feedback using more creative and formative approaches. One director shared: "In the beginning, it was difficult to change their mindset about homework because everyone liked working with paper. But we did change their mindsets because, with paper, you have to collect it and grade it. Now we can turn it into forms and insert pictures. Teachers then divide up the work, i.e., who is responsible for which practice questions, and then ask students to answer the questions online." Sometimes, how familiar teachers, students, and parents are with the tools is critical for students to receive immediate feedback.

**Online assessments can help analyze learnings**

Learning analysis is related to assessing, collecting, analyzing, and reporting data related to learners and their backgrounds to better understand and optimize their learning and learning

environments. Some digital education platforms or online software tools provide data to teachers to help them monitor and motivate students and are practical tools for measuring the learning progress of students. When teaching remotely, teachers use websites to produce tests in the form of games, a popular digital assessment approach among students, so that students can play and compete with each other. This also provides invaluable feedback to student learning. For example, one teacher shared: "Kahoot is exciting enough for kids. They like to beat the clock and love seeing real-time rankings." Teachers leveraged online assessment tools for pretesting and then conduct post-testing after lessons to analyze what students learned or what students are continuing to get wrong. This is also an example of using data to analyze students' learning trajectories, which will a major topic for teacher professional development in the future.

**Assessments are a complex task for teachers and school systems.**

Though teachers were able to use online software tools to assess students when teaching remotely, this is still a challenging and complex task, especially when problems with internet connections disrupt synchronous learning or when there is a gap in digital competency or access to remote education between students. In this case, teachers return to traditional pen-and-paper formats to ensure that high-risk students can also participate in assessments. One teacher pointed out: "It's really hard to monitor student learning online. I don't know how much they learned, how much they know. Even if I'm constantly producing quizzes on Kahoot, results are still limited." Some students sometimes accidentally leave the site, some get suck, and some aren't able to log on. "They don't know how to switch between Chinese and English and so they don't know how to type. You realize that with some of the kids, you can't really monitor them at all times," "you can't provide timely assistance to easily distracted kids," "it's very difficult for teachers to monitor learning outcomes," "I kind of set a low expectation and are grateful if they are able to even meet that." Regardless, most teachers believe that the digitalization of homework and assessments are future trends but effective assessment in remote education must ensure diversity, application flexibility, and inclusivity to learners.

## Unequal Access to Education

School closures have led to widespread concerns about worsening educational inequality, mainly because the majority of schools are forced to rely on digital technologies for remote education. Education gaps from disparities in socioeconomic status

existed before the COVID-19 pandemic, but when coupled with the digital gap, the education gap could continue to widen. Past research pointed out that disadvantaged families have less access to digital devices. In most large families, family members often share devices for working and learning remotely and often experience problems with limited bandwidth. In addition, students from low-income families may not receive sufficient support from parents, have less time and resources devoted to learning, and may not have access to appropriate learning environments, such as quiet spaces for learning or their own desks[115]. For disabled children with special needs, remote education may be even more challenging. Our research also proves that remote education could, through a variety of factors, exacerbate educational inequality. Factors include lack of prior experience with digital learning, lack of parental support, limited or no access to suitable internet connections, or limited or no access to software and learning materials for students with special needs.

### Digital competency of parents widens educational inequality

Remote education requires not only teachers and students to be equipped with the necessary digital competency, but also challenges the digital competency of parents and caretakers. Some parents have high levels of ICT skills, but we've also witnessed many parents with little to no digital competency. One teacher shared a situation where he had to instruct a parent to log on: "Oh my god, she really didn't know. The mom had no idea. She typed in the password behind the account name. I was really shocked that our parents had such little IT skills. I really couldn't understand why he wasn't able to log on until I brought out another phone to rewatch what was happening and then saw that the mom just typed in the password directly behind the account name. That was the most shocking thing for me last year." Teachers also mentioned that some parents have limited IT skills, which impacts students learning at home. Some even sent students to school when schools were closed so that teachers could provide in-person instruction. Digital education platforms are generally available in one language and so children of new immigrants may lag behind academically when learning remotely due to the lack of translation services.

### Digital devices are still an important factor contributing to educational inequality when learning remotely

A precondition to equal access to digital education is ensuring that every child has access to necessary and sufficient digital devices and the internet. Yet, despite governments allocating

tablets to schools at all levels and prioritizing lending to students from disadvantaged families, students are still experiencing discomfort in various aspects due to limitations in remote education. For some students, limitations arise from the lack of WiFi in mountainous regions: "we live in the mountains, not cities, so students have to connect to the internet at home. Unfortunately, sometimes their internet cuts out." Other students have to share spaces and internet bandwidth with parents or siblings that are also working or learning from home. Frontline teachers discovered that not all families have the space for children to learn and certain areas in the house have a better internet connection, forcing students to share spaces when taking online classes: "you can hear your student's siblings from different grade levels taking lessons online as well and it's very distracting." In one case, "the student doesn't have internet at home and so he has to use his sister's phone for hotspot but it might be very slow. They have 3 children taking lessons online at the same time and sometimes even 4 if the older brother is also taking lessons online. In that case, they might not be able to connect to the internet and so sometimes they're just there for the first half of the class." Other limitations are related to the type of devices used by students. Students may find that smartphones, small tablets, or old computers provide access to fewer functions. Teachers expressed that: "taking online lessons on smartphones is really bad because the screen is too small and if you need them to do something, they'll say that they can't because then they will get booted off Google meet." Learning remotely via smartphones also impact student vision and postures because they are staring at a small screen for long periods and so remote education has an unequal impact on health.

**Educational support from parents and caretakers is critical at the primary level**

Primary students in intermediate or lower grade levels are not as independent and so parental support is crucial for online attendance, logging into learning platforms, understanding instructions from teachers, monitoring learning, and inspiring student interest. Most teachers have experienced situations where impaired family functions have impacted students' ability to learn remotely: "some parents are more hands-off and so the student is always playing video games late into the night. He can't wake up for classes and that's just a regular occurrence." Most parents do, however, spend time supporting their children during periods of remote education. One parent shared: "for students in lower grade levels, parental involvement is very important but even more so for students in higher grade levels because these students are more familiar with computers and can switch between screens

very quickly. So they appear to be taking classes but are actually looking at other stuff." Children that receive parental support throughout their learning process generally perform better. Another parent shared: "when encouraging him to learn online, I also encouraged him to learn independently but also cared for his vision and so hoped to reduce his use of electronics when learning independently. For example, we encouraged him to use books or brought him outside. If his Chinese teacher mentioned an agency or facility, we bring him there. When they talk about religion, we show him the difference between Taoism and Buddhism by taking him to temples because we want to show him that learning takes place not only in books or online but also in real life." There is a significant difference in learning progress between students without parental support and students with systematic parental support when learning remotely.

**Parents require instructions on how to support their children's learning**

Remote education has introduced new parenting challenges for families. Parental involvement and assistance vary across families. Some parents are often burnt out from work: "I told my son that we really can't do much for him because neither of us can take off from work so he had to learn to be at home by himself." Some parents developed new strategies with their children and learned to take on more responsibilities in educating their children: "I learn with my child and work even harder than he does." One parent who is also a director at a primary school sensed that parental involvement is the most important factor: "sometimes we see the mom sitting comfortably on the couch with a cup of coffee and her tablet and she's just doing her own thing. We see that a lot but you're tempting your children. They learn that their mom loves watching TV and their dad loves video games but they have to sit in front of the computer and learn. They can't play or do anything they love. They find it unfair and so they will try to sneak in time for what they want to do. This could negatively impact learning outcomes because the student is no longer focused on learning but how they can find time to do what they want to do. They end up focusing on the wrong things." During periods of remote education, many parents are not fully prepared to be involved in their children's learning. Therefore, relying on parents' ability to do so may exacerbate educational inequality. Findings from our research point out that some parents have a difficult time comprehending their role in their children's learning: "they think that the responsibility is on the teacher." Some parents also think that parents need more instructions on how to support their children, especially at the primary level.

### Remote education is more taxing on families with special needs children or disabled children

Remote education drastically increases the load on families with special needs children as family involvement is critical to learning in this case. A parent to a child with autism and ADHD shared: "Most of the times I help him when I see he needs help because sometimes he just freezes when he has a problem and just stays frozen until even after class." In Taiwan, special needs children are taught by special education teachers for primary subjects such as Chinese and mathematics but stay with their classes for other subjects. Lack of parental involvement will lead to anxiety in special needs children and leave them lagging behind academically: "children across different groups suffer from different problems. Three children can have three entirely different issues that are related to their disorders. Teachers are unable to tend to the three students when teaching in person, much less online." When asked about this situation, one special education teacher shared: "special needs children require specialized content. I create worksheets for them but, during school closures, they can't come to school so I had to go house to house like Santa to deliver worksheets." Schools usually adopt the following strategies to ensure family involvement and effective support: customized and differentiated learning activities, additional support to educators, provision of equipment and devices, consistent communication and contact with families, support to families, and collaboration between special education teachers and subject teachers. One parent living in a remote area shared: "the teacher is great because he comes every Friday to give 1-on-1 lessons." Students with customized lesson plans may also require specialized devices and software. They also require different lesson plans and preps, including continuous assessment to confirm the applicability of online and blended learning.

### Remote education may exacerbate inequality through various aspects

In conclusion, respondents mentioned a few barriers for students when learning remotely, such as young age, lack of learning initiative, several family members sharing digital devices, lack of stable and fast internet, lack of learning spaces, or lack of privacy. These barriers may exacerbate existing educational inequalities and further impact students with special needs, from low socio-economic backgrounds, or new immigrant families: "In Kinmen, a higher percentage of students failed to pass the scholastic ability test. Did you know that? I think a lot of that can be contributed to lack of family involvement because a lot of families here are skipped-generation families." During periods of

remote education, these barriers compound to exacerbate inequality and may result in greater negative impacts than during in-person instruction.

## Mental Health

Mental health is one of the important problems presented by remote education that requires solving. Yet schools seem to attach more importance to learning continuity and academic progress and pay less attention to the happiness and socio-emotional development of students and teachers. Our research shows that, when learning at home or under quarantine, students lack interaction with peers and generally feel more lonely. Yet students largely reported less or similar academic stress when learning remotely as opposed to learning in person. For students with special needs or from disadvantaged backgrounds, remote education presents many challenges and they require special support to fulfill their emotional needs. Many parents are concerned about the risks of long screen times from remote education, such as the impact on sleep, screen addiction, anxiety, depression, etc. Yet parents are the primary emotional regulators for children and their mental health is closely tied to that of their children. Some parents spend more time caring for their children during school closures and engage more actively with their children, which allows students to actually benefit from remote education. In comparison, parents that experience other challenges during the pandemic, such as loss of employment, reduced or loss of pay, illnesses, or additional caretaking duties, will leave both parents and children in worse mental states. Similarly, teachers spend a large amount of time teaching in front of screens, prepping content for lessons, and grading student papers, which leads to added stress and anxiety from work. When teaching remotely, the happiness of teachers may suffer due to a lack of boundaries between work and life. Our research proves that emotional resiliency in teachers is beneficial to helping them overcome this challenging situation.

### Monitoring the health of students becomes more challenging when teaching remotely

Students learning at home means longer hours with their parents. This can bring families closer but may also have negative impacts on students' self-efficacy or even result in family disputes or tense relationships. In extreme circumstances, remote education may exacerbate family violence. When discussing classroom management, one teacher shared: "one of my female students reported domestic

violence. Her mother bit her thighs and left her with large bruises on both thighs, close to her butt." Though such cases do not necessarily occur during periods of remote education, the lack of physical contact provided by remote education makes it harder to uncover cases of child abuse and domestic violence. Other than problems with family functions, the physical and emotional health of students may be negatively impacted by the use of computers as learning interfaces. For example, students may suffer from screen fatigue, digital addiction, loneliness, cyberbullying, etc. One teacher lamented: "after students returned from online learning, they seem slower and have longer response times in class. I think a lot of these interpersonal problems that didn't exist before school closures started emerging after students returned." Unfortunately, teachers find it difficult to monitor and provide support when teaching online: "I have a student that requires therapy because he harms himself. Usually, I talk to him in class or during breaks but when I'm teaching online, we miss out on that connection that we had in person. When I'm talking to him in person and he starts crying, I can give him tissue paper or give him a pat. But when teaching online, we don't have that kind of opportunity." During periods of remote education, monitoring student happiness and fulfilling their emotional needs becomes far more challenging. As such, teachers require professional development in areas of psychology to help them learn how to identify and handle student problems under these circumstances.

**Disadvantaged students and their families exhibit resilience when receiving sufficient support**

During periods of remote education, many single-parent families, families with disabled children, and families with special needs children work hard to overcome the stress: "he (the student) can't keep up academically. They did an assessment after students returned to school at the end of the semester but his scores aren't a result of online learning but because we taught him, line by line, everything in the textbook." These parents are often exhausted from juggling work and caretaking responsibilities: "I just wish that I was more patient. I spent too little time with my children. Ever since they started school, they spend most of their time at school. After class, we put them in after-school programs at their schools so they usually get back at 8 PM. When they were learning remotely, we spent more time with them and we needed to adapt and be more involved. I think I just need to work on my patience." Some parents also believed that resources provided to students by schools were critical during periods of remote education: "○○ (anonymous) has a low-income family certificate because he's from a single-parent family. The teacher handed out a food stamp

(to redeem bentos at Wu-Tau) very early on so that he could learn from home. Same as last year, we borrowed learning tools such as tablets and phones from the school. The phone came with internet and we had to go to school every two weeks to replace the devices." One grandmother from a skipped-generation family shared: "the teacher is great. He helped us privately by opening up a LINE account for me." "The kid worked hard in school too. Before the end of the last semester, he received a certificate of appreciation." When teaching remotely, support and care from schools and teachers to disadvantaged families played a crucial role.

### Remote education increased and decreased teacher loading

Remote education added to the burden of parents, which naturally reduced teacher loading in some areas: "we don't do as much to mediate student disputes or lifestyle habits. It's strictly teaching." On the other hand, teachers have more work because they have to plan out academic progress, design course content, and produce assessment forms for online classes. When teaching remotely, teachers reported high levels of stress and lower levels of security when they were forced to face students and parents with a lot of questions all by themselves. The emotional experience of many teachers when teaching remotely for the first time was described as "chaotic and frustrating": "the hotlines were always busy but policies were also constantly changing and so they (parents) treated teachers like the 1922 hotline, asking us all kinds of questions." "Schools kept closing and reopening and so we never knew when we would be back in school or what kind of problems parents would come up with. We were just striving to keep up this whole time and it was honestly exhausting." "I was replying to parents' messages until 10 PM or 11 PM at night. We had to be on standby 24/7. Every morning, when I woke up, there were tons of messages that I had to respond to. You have to be very adaptive, very strong emotionally, and very patient. You have to really keep everything together emotionally." In the face of different emotional stress, most teachers relied on themselves and emotional support from their peers. There were no signs that schools were actively providing emotional support to teachers.

### Emotional resilience is helpful for teachers when teaching remotely

For teachers, teaching remotely means working long hours in a digital environment. Yet excessive screen simulation and blurred lines between work and life may add to feelings of being burnt out or anxiety in teachers. Our research shows that emotional

resilience in teachers played a critical role when facing the changes presented by remote education: "The first thing that came to mind was "Monkey D. Luffy from the manga One Piece because he can elongate his hands by will. Teachers had to adapt accordingly and transform into any shape for any given circumstances." To prevent burnout and serious long-term psychological consequences, teachers felt that "change is the only constant in life and so embracing change became important to us as we strengthened ourselves emotionally." Remote education relies on the abilities of teachers to adapt and respond quickly. Fostering emotional resiliency in teachers and helping them find a balance between work and life can be incredibly helpful in maintaining their mental health.

## Section 2 SWOT Analysis for Education Transformation in Taiwan

We interviewed primary school teachers, students, and parents. Despite attempts to include different narratives and experiences and successfully acquiring a wealth of data, our research was nonetheless subject to limitations because of insufficient time and staffing. Firstly, we were unable to acquire sufficient samples and were not able to gather information about remote education for secondary schools. Yet learning remotely may be entirely different for lower and upper secondary students as opposed to primary students. Also, interviewed teachers and parents are not necessarily representative of high-risk populations. As such, further research is required for the aforementioned areas.

When comparing the remote education experiences of teachers, students, and parents, we found that students reported the most positive experiences and enjoyed the flexibility of learning remotely. For parents and teachers, however, their sentiments focused more on "growth" and they exhibited a greater willingness to help each other and work together. Parents that became actively involved leveraged the opportunity to reflect on education and shared they believe remote education is a future trend and will depend on self-regulation in learners. They recognized the professional competencies of teachers and

expressed high expectations for education transformation in Taiwan. The efforts and resiliency exhibited by teachers when teaching remotely have indeed produced a memorable and remarkable page in the history of Taiwan education. When teaching remotely, teachers quickly strengthened their digital competency, striving to build a better connection between schools, families, and colleagues. They innovated teaching methods and worked hard to find a balance between paper and digital, physical and virtual, rules and freedom, and work and life.

The education system in Taiwan has benefited from long-term government investments in ICT equipment for schools, which supported teachers by providing a necessary digital classroom environment. The Taiwanese government has also been dedicated to promoting a plan to employ digital learning as a complementary education format. Unfortunately, not all regions have sufficient digital devices, strong internet connections, and unlimited data. Digital competency across teachers and students also varies drastically, which, when coupled with gaps in how education is implemented, may pose further constraints on the outcome of remote education. The strength of remote education is that the format, time, and location are flexible. On the other hand, working or learning in digital environments could lead to burnout and negative impacts on mental health if learners or teachers fail to establish norms, patterns, or time limits. Teachers, students, and parents have expressed that in-person schooling is irreplaceable. Teachers and parents further underscored that is necessary to rethink teaching and learning and to generate a new understanding of blended learning. Schooling is also an important setting for children to learn socialization. In-person instructions can better satisfy requirements for children to experience happiness, provide interpersonal relationships and connections, and develop socio-emotional skills. We have produced our research and observations on education in Taiwan in Table 5-1, which presents a SWOT (Strength, Weakness, Opportunity, and Threat) analysis of education transformation in Taiwan as a result of COVID-19.

**Strengths**

- Centralized organizational management can provide systematic communication and support
- Centralized digital learning services and collaboration portals
- Rapid increase in digital devices and learning materials
- Most students and teachers have the ability to use digital products
- Flexible teaching model, time, and location
- Supportive teacher communities for co-prepping lessons
- Schools and families build partnerships
- Society and culture that values education Centralized organizational management can provide systematic communication and support

**Weakness**

- Still lacking digital devices, strong internet connection, unlimited data and bandwidth in certain areas
- Digital learning service platforms not friendly enough (e.g., lacks webpage designs for disabled individuals and comprehensive translation services)
- Lack of digital materials for certain subject areas
- Limited social contact and emotional connections
- Prioritizing academics while neglecting socio-emotional skills
- Delayed feedback or lack of diversity in formats for homework or assessment
- Lack of systematic hands-on training for digital competency at the primary level
- Drastic gaps between parents' abilities to support students resulting in some students having poor learning environments at home
- Inconsistent digital teaching qualities from teachers
- Lack of systematic IT support
- Lack of attention to online privacy and safety

**Opportunities**

- More robust and complex digital equipment
- Innovative open platforms and more free digital content
- Public-private collaboration to develop new digital ecosystems
- Support digital environments applicable across subjects
- Rapid development of digital literacy in students, faculty & staff, and parents
- Increase the use of learning analysis for teaching to develop customized approaches and increase student engagement
- Provide customized approaches for the diverse needs of disadvantaged students
- Build a safety net for high-risk students so that students with problematic behavior are more driven to participate and learn
- Balanced arrangements
- Develop blended learning and life-long learning
- Strengthen collaboration among teachers
- Strengthen family, teacher, and student partnerships and parental involvement in schooling
- Increase school and teacher autonomy
- Increase student autonomy
- Re-think the nature of education and the definition of learning

**Threats**

- Digital learning environment is overloaded with information or has unclear or fragmented systems
- Limited social and human interactions
- Fragments communication or loss of oral communication habits
- Lack of feedback results in low motivation to learn
- Worsening educational inequality
- Risks in online safety, data privacy, and cybersecurity
- Work-life imbalance affects lifestyle habits
- High levels of anxiety and physical/ emotional stress from heavy workloads, lack of support, loneliness, and uncertainties
- Increased workloads for parents and intangible labor costs

Table 5-1 SWOT Analysis of Education Transformation in Taiwan as a result of COVID-19

# Section 3 Experiential Reflections and Policy Implications

COVID-19 has heavily impacted education in Taiwan, forcing students, parents, and educators to drastically transform the way they live, work, and learn. This is an opportunity for us to learn from our experience where stakeholders scrambled to adapt to remote education and uncover the long-term requirements to facilitate education transformation under the context of Taiwan.

From remote education experiences in Taiwan, we've learned that students did not benefit equally from the experience and COVID-19 has highlighted many risk factors that could impact education transformation in Taiwan. Given the current situation, remote education at Taiwan's primary level can complement in-person teaching given certain conditions. For example, remote education can be employed to provide personal support for special needs students or synchronized learning in small groups. Teachers also require more robust training, which includes training to develop their digital teaching competencies, in order to transcend existing limitations where teachers are simply digitalizing learning content. This will enable teachers to fully uncover the potential of digital technologies in education.

Strengthening and enhancing the digital competencies of all stakeholders in education is critical. This includes teaching stakeholders how to safeguard online privacy and cybersecurity when using digital resources. For students, digital competencies are required for them to learn remotely, but socio-emotional skills and the ability to self-regulate can help them learn better. A point worth noting is that socialization does not happen naturally when learning online. As a result, teachers must design specific activities to help students develop socio-emotional skills as well as the ability to self-regulate and self-care.

We discovered that, when teaching remotely, monitoring of students' learning progress by teachers in Taiwan is relatively weak and feedback on homework takes longer than usual, both of which have negative impacts on student learning. Factors such as internet connection, digital competency, and distractions in the environment may make it difficult for teachers to accurately assess students' learning progress. This also exhibits that future professional development for teachers should focus on using diverse and inclusive methodologies to analyze the learning trajectories of students.

In Taiwan, infrastructure and equipment for digital education are not prevalent enough, meaning that remote education may exacerbate educational inequalities, which is a serious threat to disadvantaged students that are often missing out on online

education. Parents play critical roles in facilitating their children's learning, but not all parents are able to handle their responsibilities in remote education, which could lead to further inequalities in terms of access to education. As such, parents require related support as well. Parents of young children and children with poor self-regulation skills also require more support and guidance.

When teaching remotely, it is difficult for teachers to monitor student health and fulfill their emotional needs. The happiness of teachers and parents is also threatened by remote education as they are forced to face different stressors while maintaining a work-life balance. We noticed that emotional resiliency in teachers has been conducive to them adapting to the adoption of remote education. Emotional resiliency and peer support have been incredibly beneficial to teachers when responding to such "chaos and frustration," meaning that professional development in the future should focus on helping teachers build emotional resiliency, including how to identify problems in students and help themselves and their students become more resilient.

Though our research has been subject to some limitations, our research outcomes on remote education in Taiwan have lined up with recent research on remote education during the COVID-19 pandemic, allowing us to learn from these experiences and reflect on the implications of some education policies.

In general, **the education system in Taiwan should leverage and unleash the potential of hybrid learning.** Some students have indeed achieved better academic performances when learning remotely as opposed to learning in person. For these students, high-quality digital teaching and the abundance of friendly digital learning platforms make remote education a viable option for customized learning. Hybrid learning can also help close the resource gap in education and benefit students in remote areas. It is, however, worth noting that remote education requires some basic competencies and

hybrid learning should only be adopted at the primary level after careful consideration. This means that Taiwan education requires the systematic development of assessment tools and survey systems, including digital competency assessment systems, socio-emotional skill assessment systems, and self-regulation skill assessment systems, to help schools assess and analyze student preparedness for remote education and use better data analysis to advance education and formulate important education decisions.

**Education in Taiwan requires more investments to ensure equality and effectiveness of student engagement in hybrid learning or full remote education.** Investing in high-quality digital infrastructure and equipment is the basic condition to ensure students from economically disadvantaged households or outlying islands can participate effectively in hybrid learning or remote education. Investing in teacher training is the only way to ensure teachers are equipped with the necessary digital competency, digital security skills, digital teaching competency, and socio-emotional skills. These skills can help teachers inspire students to learn, reduce the potential threats of digital learning, fulfill students' emotional needs, and maintain their own mental health. In addition, parents should also receive the necessary guidance to help them use digital learning platforms and provide support to their children when needed. Investments in schools and parents require systematic planning, especially for parents of students in lower grades as they require support and guidance.

**When adopting a hybrid of remote education in Taiwan, a priority should be building emotional resiliency in teachers and students to increase their level of happiness.** We must establish time limits and norms to safeguard the mental health of students and teachers and prevent burnout and anxiety from working long periods in front of the screen. Successful hybrid or remote education requires clearly defined time frames, e.g., online class schedules, schedules for homework, schedules for outdoor activities, and schedules for teacher-student communication or teacher-parent communication. Schools should set up emotional support platforms and hire professional counselors to provide services. This can help teachers, students, and families develop emotional resilience under stressful learning scenarios such as hybrid or remote education.

**Given the context of Taiwan's centralized education governance, giving schools and teachers greater autonomy could ensure that schools and teachers benefit from digital education programs.** In the future of learning, students, teachers, and schools will become partners. At the school level, Taiwan can adopt a collegiality system to empower schools to collaboratively formulate digital education action plans that are applicable to their local context. This can effectively establish a faculty and staff network

in schools and gather viewpoints and suggestions from teachers and students, thereby promoting student participation and rights. Ideally, schools can also assemble edtech teams comprised of IT experts and education experts on hybrid and remote education plans to provide necessary teaching support to teachers.

The digitalization of education is an unstoppable global trend. Taiwan education must focus on leveraging the opportunity provided by the pandemic to accelerate online learning trends and create a unique competitive advantage. Giving teachers and schools greater autonomy to formulate their own digital education action plans can help strengthen the required skills for digital transformation, increase student and teacher welfare, and facilitate the development of a high-quality digital education ecosystem.

# Chapter VI

## Education in the Post-pandemic Era

隼者，禽也。弓矢者，器也。射之者人也。君子藏器於身，待時而動，何不利之有？動而不括，是以出而有獲。語成器而動者也。

《易經．繫辭下》

# Chapter VI Education in the Post-pandemic Era

In the post-pandemic era, our education systems will gradually return to certain levels of normalcy yet our education will have been changed profoundly and education in the future will no longer be a continuation of education in the past. The education system has suffered from unprecedented disruptions, educational inequality continues to exacerbate, and there is a pressing need to remediate learning losses and rebuild education. All of this points to the fact that Taiwan education has yet to provide a practical commitment that can help us shape an outstanding, fair, and happy future. As the crisis passes, now looking back at the pandemic's impact on education, we've learned the strengths and weaknesses of Taiwan education in the face of emergencies. We are now at a turning point. We can learn from our experiences and leverage education innovations that emerged during the pandemic as springboards to a bolder and more comprehensive education transformation.

The COVID-19 pandemic was only one of the pressing crises affecting education. In pursuit of social and economic development, the human race has placed an unimaginable burden on our natural environments. Education in the post-pandemic era will not be exempt from disruption caused by natural disasters and communicable diseases. Opulent lifestyles and appalling political conflicts coexist in present-day society. The dichotomy of two extremes in society, new forms of political unrest, and military conflicts have further muddled the future of education. Rapidly evolving technology has drastically increased the quality of education but many innovative technologies have yet to be employed to promote equality and inclusion.

In the future, a change could arrive faster than we could have ever imagined and Taiwan's education must be able to react accordingly. We must embrace imagination and explore ways to shape the future of education without comprising resiliency to outside risks. We must also establish a framework that will help shape the future of education, balancing pressing and important demands and ensuring that we have the critical information we require when formulating future education strategies.

The world is heavily impacted by the pandemic and still suffering from the potential impact of learning losses. Yet there is still reason for hope. Remote education experiences during the pandemic show that educators in Taiwan have exhibited the ability to collaborate, in times of need, to unleash their potential and produce the required

knowledge and tools. If we can continue to shoulder the responsibilities of education, we can expect education transformations that could drive a more outstanding, fair, and happy future.

## Section 1 Framework for the Future of Education

Taiwan education has always moved toward modernization. Yet sudden crises such as the COVID-19 pandemic may damage, disrupt, or shift educational development trends. Crises may accelerate innovation but could also erase hard-earned progress in the past, resulting in long-term learning losses. The critical task before Taiwan's education systems is, therefore, to harness the opportunity presented by the intrinsic truth that the world is constantly changing. We must find a direction between modernization and emerging disruptions to grow more resilient, mobile, and agile to help us face the increasingly diverse demands of learners.

### Education risks & opportunities in the post-pandemic era

Viruses do not discriminate and are not bound by borders. The COVID-19 crisis brought on reflections on globalization. In the post-pandemic era, countries around the world will adapt and control globalization differently in response to the world's accelerated pace toward a complex and uncertain future. We can expect more unexpected changes that occur suddenly and beyond our imagination. Examples include worsening climate change, environmental pollution, the threat of communicable diseases, disruptions from political threats, and rising natural disasters including earthquakes, extreme weather events (e.g., typhoons, floods, etc.), droughts, and wildfires. Changes caused by these emergencies could impact the ability of education systems to provide high-quality education to their students. In the post-pandemic era, people around the world are becoming more aware that the future is unpredictable and that the COVID-19 pandemic is only one major crisis that has interrupted education but it will not be the last.

Yet, in this complex, diverse, and uncertain world of chaos, the crisis also promotes opportunities for innovation and transformation. It could bring ever-changing landscapes and opportunities for people living within it: during the COVID-19 pandemic, education became a wonderland for innovation and transformation. Technologies that

were perceived as threats in the past permeated our work, family lives, and communities at unprecedented speeds, helping society respond to challenges and becoming the best pillars in maintaining the work and education of educators and learners. These emergency situations also prompted countries and local groups to band together, strengthening innovative management for their organization and bridging areas where existing structures fail. Society also learned of the widespread values produced by partnerships between educational institutes and partners.

With the widespread use of AI, robots, IoT, 3D printing, quantum computers, nanotechnology, and other emerging technologies, the Fourth Industrial Revolution has completely changed the way we produce and work. The labor market is constantly changing and populations grow more diverse. To better contribute to society, it has become more important for people to expand their skills beyond the scope of knowledge. In the post-pandemic era, education systems must respond more resoundingly to the Fourth Industrial Revolution to ensure education keeps pace with the ever-changing social landscape, provide education according to student demands and abilities, and offer more adaptive learning pathways.

As such, Taiwan education needs to be flexible in the way it responds to the constant shifts but also prioritize moving toward modernization. This means that stakeholders of the education ecosystem, including students, teachers, policymakers, and other partners must develop agile mindsets, learn how to identify crises, and capitalize on opportunities presented by disruptions to innovate. We must strive to thrive instead of merely surviving in adversity.

More specifically, Taiwan education must strengthen the resiliency of students, learning environments, and education systems. Resilience can be broadly defined as the capacity of a dynamic system to adapt successfully to disturbances that threaten system function, viability, or development [116]. In the context of the education ecosystem, resilience means having a plan for adverse and disruptive events and the ability to learn, cope, bounce back, and adapt. According to the OECD Education Policy Outlook 2021[117], education in the post-pandemic era must become more resilient in the face of our ever-changing world to find success in unpredictable disruptions. Building a resilient education system can build a resilient learning environment and foster resilient individuals adaptive to daily challenges so that they can contribute to society and respond well to a tumultuous, uncertain, and hazy global landscape. To achieve this goal, education policymakers must first maintain and expand the

collaborative spirit that generated educational innovations during the pandemic to not only create a shared vision for the future but also formulate strategies to translate this vision into real actions.

## Multi-system Framework to Make Taiwan Education More Resilient

Urie Bronfenbrenner's ecological system theory defines conceives ecosystems for developing persons as a nested arrangement of concentric structures, each contained within the next and with each layer affecting the others. Developing persons are situated within a series of ecological systems that impact each other. The interaction between person and environment is viewed as two-directional, that is, characterized by reciprocity[118]. As such, according to this theory, a person's ability to respond to a crisis or actively adapt to adversity is not characterized by personality traits but also by factors in their social and physical environments[119]. This means that only education systems must consistently react to the needs of students, teachers, schools, and other stakeholders throughout regular and tumultuous times to exhibit resilience in education.

To map out a vision for a more resilient future of Taiwan education, we have conceived a multi-system conceptual framework according to the ecological system theory. The multi-system conceptual framework segments the education ecosystem into three system levels: education system, learning environment, and learners (in the case of this whitepaper, children). We've also dissected the conceptual vision for education into three actionable parts: vision, plan, and strategies (see Figure 6-1). Using our multi-system conceptual framework and building on literature analyzed in previous chapters (Impact of Covid-19 on Education, Education Innovation During the Pandemic, Global Education Transformation, Advantages & Challenges for Education Transformation in Taiwan), this chapter will construct a multi-system framework that could help build a more resilient future for Taiwan education by setting forth visions, plans, and strategies for each other three system levels: education system, learning environment, and children. The framework aims to answer major challenges emerging from the post-pandemic era and provide critical information for the formulation of education policies to strengthen resiliency at the education system level, learning environment level, and learner level.

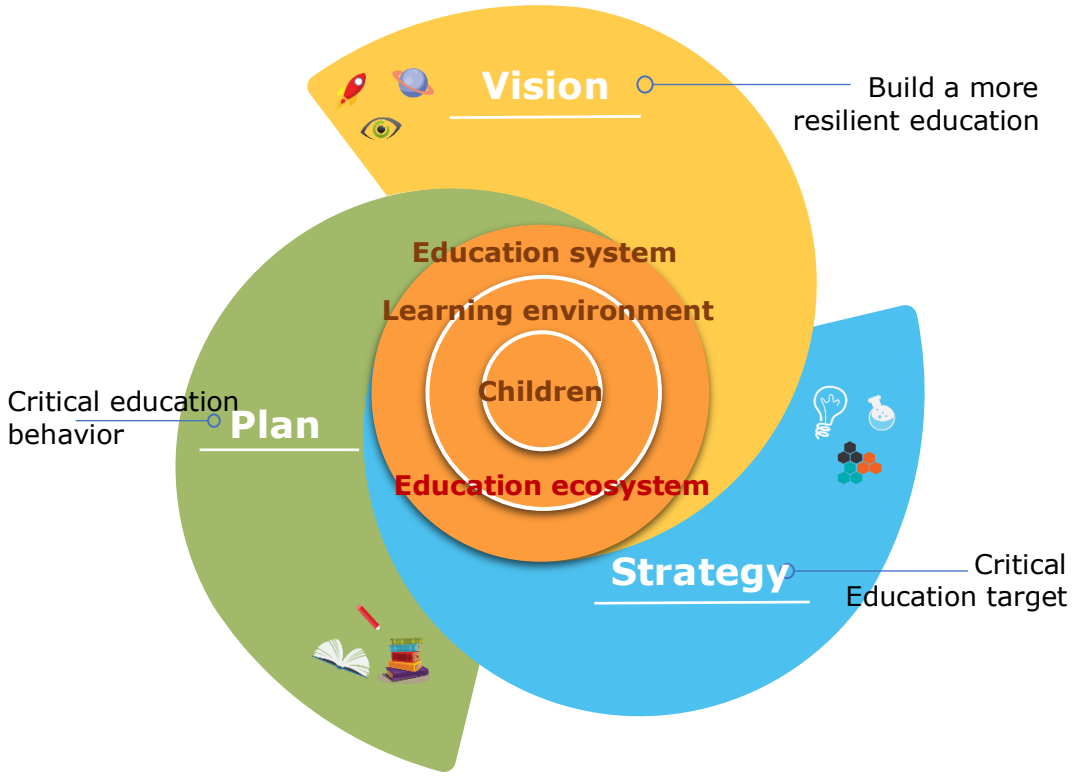



Figure 6-1 Multi-system Framework for a More Resilient Future for Taiwan Education

## Section 2 A More Resilient Education System

In the post-pandemic era, the top priority in Taiwan education is to build resiliency into our education systems. In an ever-changing world, Taiwan's education system must learn how to simultaneously develop with the future demands of this world and compile preparation, coping, and recovery plans to predict and respond to changes. System-level stakeholders in the education system must actively and consciously build up system resiliency. We can maintain and expand the collaborative spirit that generated educational innovations during the pandemic to promote transformations in education systems.

### Scenario

June is a fifth-grader that is entering puberty. She originally lived in New Taipei City but a global pandemic affected her parent's work

and marriage. June's parents divorced last year and so she moved to Yuli Township in Hualien to live with her grandparents. Recently, a 6.5-magnitude earthquake destroyed her school. Yet, these are the crises that are visible to June. She is yet to realize that the world is changing: the Fourth Industrial Revolution, climate change, political conflict, and global inflation is filling her future with uncertainties.

Despite that, June has been able to benefit from a resilient education system that has been able to consistently develop quality education. June's education system has a general information management system to support student learning. Though the system requires heavy funding from the government and may pose information security risks, it successfully mitigated the impacts of the school being destroyed by the earthquake, ensured the school could adapt to the sudden change and created the necessary conditions for June to continue learning.

This powerful general information management system can monitor and predict changes in learning demands. It can also collect a wide range of data about learners, learning environments, and education systems to then conduct smart data smart analysis and empower data users to effectively apply outcomes. Using this approach, the general information management system created coherent documents for all students to detail how they learn and the trajectory of their demands, including their interests, what bores them, where they progressed rapidly, and where they were stuck. Teachers are then able to identify priorities based on system-generated information and give students more autonomy over their learning content, approach, location, and time.

June's education system also provides a series of dynamic learning pathways that changes with learners and new developments. The system will connect education with the constantly evolving labor market based on learner potential and expectations. The education system is therefore able to support students like June who have transferred from New Taipei City to Yuli Township in Hualien, transitioned from in-person instruction to remote learning, or graduated from primary school to lower secondary school. It builds bridges between different education structures, stakeholders, and processes to provide dynamic learning pathways based on a student's changing demand trajectory to ensure that the transition is smooth and successful.

June's education system adopted a bold approach by promoting this general information management system that enabled actors in the education system to collect, convey, and use data to set learning

priorities and have the necessary skills to define learning pathways applicable to student demands and potential. The vision of this resilient education system is to create suitable learning conditions for learners and support the country's long-term development plans, a strategic vision in pursuit of excellence.

June's story is a fictional vision. But with the right plans and strategies, we can make these visions a reality.

## Plan to strengthen resilience in education systems

Potential risks to present-day education systems could be foreseeable changes, to a certain degree, or entirely surprising ones. Either type of change could lead to disruptions and interruptions in education systems and result in the following outcomes. First, the change could impact the education system's internal and external relationships, e.g., disrupting national education development visions, resulting in changes to national education priorities, or impacting the country's competitiveness in education or potential for global collaborations or exchanges. Second, the change could impact resources accessible to and provide by education systems, e.g., education funding, number of faculty members and staff, the way education is provided, or disruptions in the labor market's supply and demand.

In the face of these potential risks of disruption, education systems must be able to endure changes, be prepared, and use experiences to promote transformation. A literature review conducted for this whitepaper reveals that Taiwan should leverage our R&D, manufacturing, and logistics advantages in tech to deploy big data and AI at the education system level and use the two following plans to strengthen resiliency in education systems: 1. develop a general information management system for smart learning and 2. provide a dynamic learning pathway that progresses with time.

### Develop a general information management system for smart learning

The first step to building resiliency in education systems begins with enhancing the "intelligence" of education systems. When education systems are equipped with databases and knowledge bases related to student learning, they have more insight into how they should act and can formulate education policies based on empirical evidence. As such, education systems must systematically collect a

series of student-related information to grasp the performance and progress of education systems. More importantly, such data collection and analysis must be robust and comprehensive because only then will education systems have enough information to analyze the progress of learners and education systems toward long-term targets. In addition, data collection and analysis must be agile enough to quickly adapt to changing environments in times of crisis.

Resilient education systems must also ensure that they can convey critical information to system actors and that these actors are equipped with the necessary skills, tools, and environments that enable them to capitalize on and benefit from analyses of learning data. The plan must be cost-effective and strategic so that educators are able to utilize the information they need with ease when trying to use practical resources from the system to achieve education goals.

### Provide a dynamic learning pathway that progresses with time

A resilient education system must develop broad, flexible, and coherent education services so that children can find learning pathways compatible with their demands and interests. The provision of education should also ensure that children can learn requisite skills and competencies so they can contribute to society and the job market in the future. Education systems should also actively volunteer information about career development to help them develop realistic but ambitious goals. To such ends, systems providing learning pathways to children must be flexible enough to predict and adapt to changes in the post-pandemic era, which will undoubtedly be a time when demands for skills change and such change is accelerated or even transferred.

## 3 Strategy to strengthen resilience in education systems

### Develop learning assessment tools and integrate data collection platforms.

As more and more students require complex skills beyond knowledge and holistic education to manage the ever-changing world, education systems must reflect these goals in general information management systems for smart learning, developing learning assessment tools, integrating data collection platforms, and reviewing education performances from a more balanced perspective.

When collecting data from learning assessment, we must consider the scope (various aspects of learning), type (assessment format and how data is collected), layer (system layer for data collection), and time (continuous assessment, finals, real-time data, and long-term data) of assessment from a strategic aspect. Broadly defined, education systems can adopt different approaches to collect learning data about students, including information about traditional academic development and broader information on interpersonal development. This includes various assessment types, including teacher observations, written in-class tests, and standardized assessment tools. For example, Estonia developed a series of voluntary, unmarked, but feedback-packed formative assessment tools including learning, self-management, and communication skills tests; unmarked tests to evaluate math, science, and language (reading) literacy; and tools to measure student, teacher, and parent satisfaction in education (please see Section 2 of Chapter IV). The collection of learning data should cover different governance levels (institutes, local, regional, national, and international) to effectively provide differentiated analysis of target resources. It is also important to continue collecting data at different points across a student's learning process and use summative, formative, and diagnostic assessments evenly. Lastly, education systems should consider which tools, from a strategic standpoint, can help systems monitor progress and improve future plans. For example, adopting an indicator framework, qualitative research in specific areas, and policy and plan reviews can be helpful to such system reviews when coupled with the aforementioned tools for monitoring student outcomes.

During the COVID-19 pandemic, some students were unable to receive fair grades due to homogeneous or flawed learning assessment systems for remote education, which further impacted their opportunity to access higher levels of education or employment, turning them into victims of improper systems. We must learn from these experiences and strengthen the resiliency of education systems so that when education systems are impacted, robust learning assessments and data collection can provide better safeguard stakeholders in education.

As we welcome the age of big data and open data, digital technology could play a vital role. Integrating data collection platforms can help us compile data from education systems and administrative statistics from national and local agencies to analyze correlations and causations that were previously difficult to uncover. The foundations for developing learning assessment tools and integrating data collection platforms should be the primary goals of

our education system. We should also strengthen the reliability, validity, and flexibility of assessment and data collection programs.

**Conduct requirements analysis for education stakeholders and convey critical information with intentions**

In the process of collecting the correct learning data to capitalize on this information, effective data analysis and conveying of critical information with intentions are important but often ignored steps. If the collected data on learning is rarely published, hard to find, or considered to be not useful, the information could not be passed on to actors in the education system and will undoubtedly result in a waste of resources[120]. Education systems lack the ability to convey and communicate critical information to the masses, which makes it harder for them to effectively utilize the evidence they collected and produced to improve student learning[121].

It is therefore a major challenge for the education system to intentively and appropriately analyze learning data. Decision makers in education systems are required to map out data analysis based on the requirements of different actors and clearly define the roles, goals, and data sources for different actors to help them confirm what kind of actors requires what type of data at what times and how to best communicate information derived from data analysis. As such, education systems must leverage robust IT systems and digital tools to build an effective reporting system and find a balance between oversimplification and far too many technical details.

Communicating learning data and critical information with intentions is not a top-down process. Such information should be communicated horizontally and vertically. For example, during the COVID-19 pandemic, frontline teachers worked hard to collect information from online education and communicate/ share experiences and outcomes from innovative experiences. Even though educational innovations have yet to mature, communicating data from experiences from the bottom up and horizontally can accelerate progressions under a disruptive and changing landscape. It can also help education systems identify priorities, remediate learning losses, and continue to promote innovative initiatives that are both cost-effective and impactful.

As such, a resilient education system will underscore clear and credible analysis of learning data and the value of communicating information. Effective communication of critical information derived from learning data to teachers, parents, students, scholars, researchers, and the masses can, on one hand, empower teachers,

parents, and students to monitor learning progress and help students, families, and schools build partnerships established on mutual trust. On the other hand, it can also help decision-makers at all levels in the education systems use integrated data analysis to progress education plans and strategies and gain public support. Effective learning data analysis and communication can also help reduce information asymmetry and inequality when actors are making critical decisions such as which schools to attend, learning pathways, and career options.

To give an example, the Estonian Education Information System (EHIS) is available to teachers, principals, parents, students, scholars, policymakers, researchers, and the public. Teachers and principals can use statistical data and indexes on the HaridusSilm (Education Eye) platform to compare their school's performance against other schools and subsequently improve. Students and parents can compare how successful different learning plans bridge into the job market or access a school's performance in national examinations or student satisfaction levels through "school cards." City governments and state governments can also use these data to help them make decisions, i.e., policymakers can track the growth and changes of individual students with databases and link up data from educational achievements and employment. Presently, Estonia is still developing new data analysis that will allow them to uncover the full potential of its data[122].

In an ever-changing world, education systems should communicate the advantages and weaknesses identified with learning data but also foster a growth mindset in decision-makers, workers, learners, and their families. This means that to facilitate greater mutual trust and continued dialogue, education systems must, in some cases, admit to their flaws, clarify the capabilities and limitations of data analysis, foster a culture where failure is considered an opportunity for learning, and ensure that impacts from their decisions are transparent.

**Help actors in the education system understand assessment data and apply the data to improve learning**

To ensure data analysis from learning assessments generate real impact, actors in education systems such as students, parents, teachers, and principals must be fully aware of how they can utilize the resulting data. Teaching students how to assess themselves is the first step to supporting students to use learning data. When students are able to regularly assess their progress and review their learning strategies, they are able to be more responsible for their

learning[123]. When functions of education systems are disrupted, as in the case of the COVID-19 pandemic, ensuring that students have the opportunity to regularly assess their work is conducive to helping students adopt meaningful action based on their progress.

Strengthening data and assessment literacy in educators is also important. Teachers and principals require specific knowledge and skills to interpret students' learning data and to use these data to diagnose sources of learning challenges. This will help them formulate appropriate remediation measures for different students. Educators must learn how to use various assessment tools to evaluate students' learning trajectories and provide constructive and accurate feedback to advance the future achievements of students and introduce greater equality into education[124].

Education systems require long-term investments to strengthen internal information management and analysis competencies within the national education system. Education systems must also collaborate with professional education assessment institutes, academic researchers, private organizations, and international organizations as this can help strengthen actors' abilities to use learning data and information. Developing a general information management system for smart learning is conducive to enhancing the management efficiency of education services and can generate useful information so that actors in education systems are able to formulate plans for the future, make smart decisions, and measure the outcomes of education policies and plans[125]. More importantly, ensuring that actors in education systems appreciate the value of using data information can help convert information into actions, which can further improve student learning and uncover pathways to success for students.

**Provide flexible and diverse learning opportunities to ensure successful transitions within the education system**

For a resilient education system to provide dynamic learning pathways that continue to progress with the times, it must be able to ensure successful transitions within the education system. One of the key strategic goals set forth in the Estonian Education Strategy 2021–2035 is "learning opportunities are diverse and accessible and the education system enables smooth transitions between levels and types of education." This means that to ensure smooth transitions, education systems must provide diverse and coherent courses to adapt to the changing needs, interests, and competencies of students.

Supporting smooth transitions within the education system, from early education and daycare to the primary level and then to the secondary level, can help systems foster a progressive learning environment, prevent students from falling behind academically, and care for disadvantaged students. As such, it is critical to underscore continuity between courses and teachings, strengthen coordination and collaboration between people and processes across different education levels, and facilitate parental involvement.

Education systems should be committed to providing flexible and diverse learning opportunities to strengthen the resilience of education systems. This includes creating the necessary conditions that can ensure a smooth transition between different levels and types of education and the employment market. For example, providing education suitable for the requirements and abilities of all learners in micro modularized learning (e.g., micro certification). Alternatively, education systems can formulate a comprehensive solution to include unofficial and informal learning into formal education to attach more importance to knowledge and skills acquired from other environments (digital environment, workplaces, environmental education centers, and youth centers) to help those that have previously suspended education and are now returning to schools.

In addition to adjusting structures to ensure smooth transitions, education systems must also strengthen collaboration between teachers and workers at different system levels. Education systems should build bridges between workers and processes across different levels and types of education to facilitate the exchange of information regarding individual students and support teachers in preparing for courses and teaching. This includes looking back at the past learning experiences of students and looking at their next steps. Education systems can build a shared awareness of responsibility between workers at different education levels and strengthen the clarity and quality of information exchanges between educators, students, and parents to prevent students from falling behind academically or dropping out.

**Strengthen connections between education, society, and the job market to support student ambitions and foster realistic career aspirations**

Our current society is competitive, filled with intergenerational injustice, and has a large wealth gap. As such, many young people are quitting. Yet education is still the key to social mobility. A resilient education system must foster realistic but ambitious career

aspirations and help them look forward to their future careers. More importantly, education can effectively help students develop a sense of identity and urge students to reflect on how their educational decisions translate into their future economic lives to support their ambitions and encourage realistic career aspirations[126].

Education systems that are unable to ensure students have insight into the future of different work prospects and access to related information may negatively impact students as they enter the job market. As such, education systems can use course design to increase student exposure to various industries and ensure that students have fully comprehended the careers, educational, or training pathways that are available to them. Schools can incorporate vocational guidance into courses and organize activities with professional vocational instructors to give students more opportunities to access information about careers. Schools can also provide career lectures to help overcome stereotypes about certain careers or organize career lectures, workshops, and mock interviews to strengthen vocational guidance.

Effectively fostering realistic career aspirations in students requires quality education, a wealth of vocational information, and expertise in sharing vocational information. In the post-pandemic era, resources will continue to dwindle and inequalities will continue to grow. Under this context, education systems must commit to providing vocational information and financial support to those that need it most. Education systems must also support changes in student behavior, attitudes, and self-awareness to empower them to harness their own learning pathways.

## Section III A More Resilient Learning Environment

Children spend much of their time in learning environments, which is thus a critical factor in determining their resiliency. Mencius, a famous figure in Chinese history, was said to have been relocated three times by his mother for a better learning environment, evidencing that the environments and conditions surrounding children undoubtedly impact their learning, health, and development. The COVID-19 crisis has heavily impacted learning environments but also accelerated collaboration across more widespread stakeholders in education ecosystems. In the post-pandemic era, as the way we learn begins to change, we can choose to progressively strengthen the resilience of learning environments to facilitate more diverse and meaningful learning for children.

## Scenario

June has transferred from New Taipei City to Yuli Township in Hualien, which may appear to be two drastically learning environments. A recent earthquake destroyed some of the classrooms at her school in Yuli. June was sent to another school for hybrid learning, but she discovers that these schools are quite similar in many ways as they all provide a resilient learning environment.

At her school in New Taipei City, classrooms were equipped with interactive whiteboards and their IT classrooms and labs were all fully equipped. At the school in Yuli Township, Hualien, the buildings are older and the internet connection is at times unreliable. Despite poorer classroom environments and resources, the school attaches the same level of importance to learning quality. In both schools, educators sought to build or strengthen collaborations with other schools, private organizations, or NPOs to share teaching practices, learn from each other, and provide students with more and better resources.

June's school created a learning environment that transcended its campus. The large and diverse learning environment is more akin to an active network of local education services where the people and processes are more valued than the classrooms and facilities. June receives a series of services every day, including quality education, nutritious lunches, extracurricular or club activities, work experiences, vocational guidance, and counseling. Some of these services are provided by schools, while others are from community organizations that have established close ties to schools. Faculty and staff are keenly aware of June and her family's circumstances and have worked with June's family and non-education experts to craft a quality learning plan for June.

This type of resilient learning environment is promoted through strong leadership awareness. Educators are given enough autonomy to translate national system visions into goals that fit under the local context, e.g., the requirements of learners and local communities. They can continue to perfect education strategies to form a fair, active, and collaborative local education services network. A resilient and large learning environment cares about the welfare and processes of educators and about building comprehensive, in-depth, and long-lasting partnerships that can facilitate rich and meaningful learning for all. Actors in the learning environment and partners work together through collective reviews and experience sharing to build a

shared professional ideology and innovate education, forming a new force for promoting systematic transformation.

## Plan to strengthen resilience in learning environments

Educational institutes are easily affected by various impacts and stresses. For example, unfortunate human actions on campus, damages to the school from floods, earthquakes, or fires, etc. These potential impacts may damage a school's ability to provide quality education and lead to several outcomes. First, an education institute's internal and external relations may be affected by adverse events such as personnel changes (principal, teachers, etc.), changes in job requirements for teachers, or changes in the relationship between schools and community partners. Second, adverse events may impact the resources that educational institutes can acquire and access, leading to a lack of material and human resources, forcing class suspensions and school closures.

As such, education institutes must strengthen resiliency and serve as an intermediary between education systems and learners, actively responding to various changes. According to the literature review in this whitepaper, Taiwan can leverage its advantage of having professional and passional teachers, private-public collaborations founded during the pandemic, and the innovative spirit and sense of responsibility in co-prep communities to build an education service network and give more autonomy to educators. We can then strengthen resilience in learning environments revolving around two core projects: 1. build an education service network with the school at the core and 2. foster entrepreneurship and resilience in educators.

### Build an education service network with the school at the core

The COVID-19 pandemic reminded us that remote education is a future trend but it cannot replace in-person instruction in schools. Learning can happen anywhere and at anytime but the social functions of formal schooling are by no means negligible. At the end of the day, people are the core of education. Throughout their learning journeys, children interact with classmates, teachers, parents, and other professionals. That interaction is far more valuable than the tools and spaces they use. Embracing such learning is intrinsically embracing its nature of socialization and understanding that people and processes are the real actors that unleash children's

potential, only then can we comprehend the key to strengthening resilience in learning environments[127].

Before the pandemic, schools faced obstacles when seeking more in-depth collaborations with third-party individuals or service institutes, but when schools act as an island of their own, student learning suffers severely. The COVID-19 pandemic provided an invaluable experience, which is that close collaboration between education systems and actors and clear and regular communication between teachers, students, parents, and communities are conducive to mitigating learning losses from the crisis. In the post-pandemic era, the definition of a learning environment has already transcended the school's physical campus and expanded into an education service network with widespread partners and the school at its core. Strengthening partnerships with parents, teachers, and community organizations to expand the education service network can help increase benefits to students from a stable learning environment and strengthen the resilience of learning environments.

**Foster entrepreneurship and resilience in educators**

In the education ecosystem, schools act as intermediaries, coordinating different actors, resources, spaces, and learning models to provide a coherent and adaptive education experience for students and help students and families receive widespread services (e.g., nutrition, transportation, and socio-emotional support). The roles of principals and teachers, in this case, are especially important. A resilient learning environment requires educators to have entrepreneurship as it will make them more open to diversity and shaping learning environments. This can stimulate more educational innovations to fulfill student requirements in an ever-changing environment.

COVID-19 has had major impacts on the work of teachers, helping teachers adapt to a new learning model has thus been listed as a priority. During this time, governments have provided much support for the professional development of teachers yet digital tool training and compiling educational resources have received more attention than fostering digital teaching competency and facilitating emotional health. In the post-pandemic era, strengthening resilience in learning environments requires us to care more for the welfare of educators, encourage entrepreneurship in educators, and enhance teachers' ability to apply digital skills to their teaching.

## Strategies to strengthen resilience in learning environments

### Promote coordinated education services and connect more partners

Learning environments in schools are easily damaged by manmade or natural disasters. As such, education actors should foster comprehensive, long-term, and in-depth partnerships with each other to uncover the potential of collaborative efforts, which could prove vital to the stable and consistent provision of education services and quick recovery from crises.

The pandemic has resulted in significant changes in the ways schools interact with parents, communities, private companies, and other local partners. In terms of collaborations between schools and families, parental involvement in student learning has positive impacts on children learning, socializing, and emotions. This is especially so for parents of younger children. Full remote education was an unprecedented situation that created challenges for parents, teachers, and schools but also increased interactions between them on online learning platforms or social media. It became an opportunity to strengthen relationships between families and schools and is conducive to strengthening parents' abilities to support at-home learning for the long term[128].

Schools can build partnerships with community organizations and private companies to create more education opportunities and find more learning resources for students. Schools can coordinate resources from individuals, families, local communities, and other regions; provide extracurricular activities with the help of parents and community volunteers; plan to expand partnerships with community groups; invited private companies to organize career lectures; and open school facilities to the public for strategic partnerships. The government has been working hard to promote partnerships between schools and partners outside of the public sector, which could be hugely beneficial to students.

Partnerships revolving around coordinated efforts between schools and outside parties can help strengthen resilience in children, schools, and communities, providing more opportunities to maintain education continuity when crises disrupt learning environments. In the post-pandemic era, developing the ability to effectively engage in education services is critical for education actors. We must also provide the tools, spaces, and opportunities to learn skills that are

necessary to capitalize on partnerships, including fostering parents' abilities to support at-home learning.

### Provide one-stop services to satisfy student needs more comprehensively

As an important institute for facilitating social justice, schools build bridges between different students and public services, providing one-stop services to help students and families access public resources to maintain health and welfare. This is conducive to holistic student growth and can strengthen the ability of learning environments to satisfy student demands.

For example, Nova Scotia of Canada launched the SchoolPlus, defining schools as a center providing a series of general services to support the welfare of students, families, and communities. The initiative's coordinators and community outreach workers are responsible for maintaining connections between schools and communities, helping families learn about available local services, and identifying gaps between service supply and demand. This strategy strengthens inter-agency collaboration within the government and improves coordinated efforts across public services such as judiciary, education, society, and sanitation services so that children and families with complex needs are also able to benefit[129].

Centralizing public services will, however, require clear and defined responsibilities for different services. The success of this one-stop service model is contingent on the relationships and qualities of professionals supporting children and families. As such, when implementing these strategies, we must consider the time and drivers required to develop these relationships and provide the necessary space and opportunities. Accountability in experts and service departments as they work together, clearly defined roles, functions, and overall objectives, and high-quality relationships can produce many positive impacts on long-term collaborations

### Encourage educators to share innovations so that effective innovative practices can flourish

Successful innovative strategies, however significant or minor, could create resources and opportunities for learning. Innovation actions adopted by educators during the pandemic will be equally important in the post-pandemic era as educators will be required to mitigate learning losses incurred during the pandemic and help the diversifying mix of students adapt to an ever-changing socio-economic landscape. To ensure that principals, faculty, staff, and schools are able to preserve new knowledge and skills acquired

during the pandemic, it is critical that we encourage them to share the best localized practices and impacts on learning. This helps ensure that these practical approaches can be expanded to other environments, helping principals, teachers, and other education actors overcome plateaus throughout the learning curve and provide information for decision-making.

Schools should also carefully consider the applicable scope of innovative practices and apply key strategies to their scenarios or abandon/ incorporate these strategies depending on their impact and outcomes. On one hand, countries like Estonia employed a carefully designed accountability system to give education actors autonomy, tools, and abilities that enable them to innovate at the local level or adapt national policies for local contexts. This helps schools develop resilience as they respond to community requirements. On the other hand, we have countries like Korea that opted to use centralized governance systems to support vertical and horizontal learning and sharing across schools, which is conducive to local regions developing their own innovative capabilities (see Chapter IV).

**Support educators to achieve work-life balance to strengthen their resilience**

Impacted by the COVID-19 pandemic, the work of teachers experienced major changes, and teachers were asked to shoulder new responsibilities and develop new knowledge and skills. Many teachers benefited greatly from professional development provided throughout periods of remote education but taking on new responsibilities also left them feeling stressed. In the post-pandemic era, policymakers will need to balance changes and innovations in teachings and work hours and workloads for teachers as well as value their satisfaction levels with work and life to strengthen their resilience.

As digital learning is becoming a new norm, it is becoming more important for teachers to acquire digital competencies and integrate them broadly into their teaching. Governments should provide opportunities to support professional development based on the needs of educators. In this area, empowering teachers to set up learning communities for professional development and encouraging teachers to learn with students and peers are helpful to teachers building the confidence to adapt to changing environments. School-embedded forms of professional development such as observations, internet, and coaching can be used to provide on-site teaching experiences as they are cost-effective and can be adapted to specific

school environments. It can also generate greater impacts on teaching and student learning.

Promoting administrative leadership in principals and strengthening teaching leadership in teachers are critical for enhancing resilience in learning environments. During the COVID-19 pandemic, many schools and regions adjusted regulations, changed strategies, and broke free from limitations to respond to their challenges. Under an ever-changing environment, principals and teachers identified priorities in emergency situations, coordinated communications, and built a new consensus, leading to critical impacts in education transformations. Policymakers should also foster administrative leadership skills in principals and teaching leadership skills in teachers to foster transformations and promote change in existing systems.

In the post-pandemic era, principals and teachers may be required to adapt to new roles and take on different responsibilities as students and the world continues to change. We believe that we can strengthen resiliency in teachers by exchanging knowledge and practices, facilitating cooperation between teachers, and providing social support for educators as they attempt to overcome challenges. Principals can take action to reduce non-teaching workloads to ensure stress from work does not negatively impact teacher motivation, commitment, or self-efficacy. Governments should also increase teacher happiness from the system level by increasing benefits and pay or providing additional staffing or financial resources. These measures aimed at strengthening educator resilience require long-term efforts to resolve limitations imposed on the work and lives of educators from an organizational standpoint.

## Section IV Fostering More Resilient Children

All children may experience various challenges. Perception and logic in young children are still underdeveloped. They also lack experience, knowledge, and the ability to choose. Major events such as broken families, death of family members, illnesses, transfers, or bullying could therefore become a source of stress or trauma. The challenges presented to children also depend on the society they are growing up in. As such, they may face entirely different challenges from their parent's generation. For example, children of this new generation are referred to as children of the consumer electronics generation, i generation, or metaverse generation. The way they socialize is rapidly shifting from the real world to the virtual world. This results in greater risks of cyberbullying and challenges of how to

correctly use the information on the internet. Every action taken in the online world could leave traces and have profound impacts on their future careers. Challenges in the post-pandemic era, therefore, highlight the importance of fostering resilience in children. Resilient children are able to recover from setbacks, adapt to various tasks and challenges, and capitalize on the opportunity to unleash their potential. Education can be more proactive in cultivating resilience in children and helping them grow the confidence to face an ever-changing world.

## Senario

June's journey has been filled with challenges, but she has always used the opportunity to explore her own potential. During the pandemic, June's parents became stressed over finances. Without parental involvement and with added stress, June's progress when learning online lagged behind. Thankfully, her teachers understood that each learner has different circumstances and demands. They were therefore able to support her and help her overcome these challenges. June's teachers adjusted her learning, providing ten hours of 1-on-1 tutoring and helping her make arrangements for learning at home. When June moved to a new school, she received support from the school counselor. June's school values student happiness and provided various measures to promote mental health and develop socio-emotional skills to help students facing different challenges. Her school also continued to adapt and improve its measures according to changing demands.

Thanks to a resilient education system and learning environment, June has been able to flourish and feel valued. She is now equipped with the knowledge, skills, and attitudes for adapting to different lifestyles. She can connect her experiences from New Taipei City, Yuli Township, learning at school, learning online, and life before and after the pandemic together to produce new learning opportunities in situations of change. As such, June has grown better at progressing in her learning and has learned how to have a positive impact on her surrounding environment.

In her life, she will undoubtedly experience sadness but she will not despair. She will go through many more changes and tumultuous times that require her to adapt to adversity. He resilient education system and learning environment have fostered resilience within her. With time, her resilience will help her value change as an opportunity for learning and growth and she will seek ways to grow in times of difficulty.

## 2 Plan to strengthen resilience in children

The world is becoming far more complex and diverse at a faster rate than before. Different possibilities begin to unfold for our future and children of this generation are experiencing more changes than past generations, some intentional and others not as much. Regardless, these changes produce potential impacts on children and may lead to the following consequences: first, change may impact the emotional and physical health of children and disrupt family functions and the development of interpersonal skills. Second, change may threaten children's access to learning resources and impact their future prospects.

In the post-pandemic era, children need to cultivate resilience to help them respond to change and disruptions and more proactively adapt to daily challenges and external impacts. According to the literature review in this whitepaper, Taiwan education can leverage experiences of remote learning and hybrid learning during the pandemic to provide inclusive and fair education, strengthening resilience in children through two core projects: 1. facilitate sustainable development of inclusive learning and equal education; 2. give children more autonomy and responsibilities.

### Facilitate sustainable development of inclusive learning and equal education

When schools closed during the pandemic, education systems made widespread efforts to close the learning gap and overcome educational inequalities. They encouraged flexible classroom arrangements, personalized learning plans, and targeted support for disadvantaged or high-risk students. As students returned to schools, we discovered that we didn't have an internal mechanism in place to sustain and further develop many innovations and measures supporting disadvantaged children during the time of crisis.

In the post-pandemic era, considering the personalized requirements of each child and the complexity and diversity of challenges faced by disadvantaged children, policymakers should consider how to balance the individual and the collective, student-directed or teacher-directed education, and customization and standardization on the basis of adaptive learning. Policymakers should also leverage digital resource platforms to more systematically provide personalized learning methods to all children through a coherent and complementary action strategy, providing continued

support to disadvantaged students to close the inequality entrenched in education.

### Give children more autonomy and responsibilities

When learning models shift to remote or hybrid education, fostering skills and mindsets required for children to thrive in self-directed learning is far more important than solving problems with information devices and internet connections. Education systems have plenty of room for improvement when it comes to supporting children to be better prepared for an ever-changing world in the post-pandemic era.

The top priority for building children's resilience is to help them build a sense of self and maintain a proactive relationship with themselves. Supporting socio-emotional development in children and facilitating children's happiness and mental health are conducive to increasing learning motivation. In addition, listening to students and valuing their engagement and rights will empower their voices to become more systematic, regular, and influential. This helps create a sense of belonging in their learning environment and can help them be more comfortable with facing their worlds.

## 3 Strategy to strengthen resilience in children

### Use digital resource platforms to provide personalized learning to children

In the face of heightening global risks, children in the post-pandemic era may have entirely different learning demands due to changes in the environment. Education systems should be more agile to provide children with personalized learning. Broadly speaking, personalized learning refers to flexibly adapting education experiences based on learners' interests, competencies, aspirations, and social, cultural, and linguistic backgrounds. As such, providing personalized learning experiences to children is conducive to increasing children's participation in learning, closing the learning gap, and enhancing children's competencies based on their different potentials, targets, and passion to achieve inclusivity and quality in education.

When education systems or teachers seek to provide personalized learning experiences, it doesn't mean designing unique courses and learning pathways for every single student. The focus of personalized learning is to provide options and flexibility for when, where, what, and how children learn. For example, differentiated

teaching in shared courses or visions or empowering children to control their own learning. When students can freely decide what to learn and have a positive impact on how they learn, they usually exhibit greater learning motivation and are more certain about their learning objectives and purposes, which thereby strengthens their resilience[130].

Digital technology has opened up a series of possibilities for personalized learning. Digital resource platforms, when used well, enable children to learn anywhere and not have to choose between different activities. Smart online tools can also adjust content, progress, and assessment approaches based on the child's circumstances. For example, South Korea developed a general online learning platform to integrate digital learning resources for students and teachers with schools' information management systems. They also used big data and AI to support personalized student learning (Please see Section I of Chapter IV).

But digital technology is only a propeller for personalized learning. For young children that lack self-regulation skills, personalized learning requires building closer relationships between teachers, students, and parents and finding a balance between students and teachers in terms of control over learning. The key here is not the equipment but the roles that teachers and parents play in personalized learning. Providing more options to children does not minimize the teacher's impact on constructing student learning. Education systems give schools and teachers more autonomy so that they can adjust learning pace and content based on their understanding of their students. Education systems are also dedicated to increasing digital learning resources, implementing and monitoring personalized learning plans, and using blended approaches to find the best balance between individual/ collective and student-directed/ teacher-directed learning.

**Continue to provide additional support and dedicated guidance to children with special needs**

Personalized learning does not mean designing courses for every single child, but satisfying the general demands of children in terms of when, where, what, and how they learn. Many children are unable to control special circumstances that impact their learning experiences, chosen education pathways, and even aspirations, which may have negative impacts on resilience in children. As such, children of special needs require additional support or dedicated guidance on top of personalized learning to tap into their full potential. It's important to note that when the development of education

ecosystems is disrupted or interrupted, the non-linear change may exacerbate educational inequalities and learning losses for vulnerable children. We can use dedicated support, resource redistribution, and other measures to foster equality in education and strengthen equitable resilience[131].

Providing additional or dedicated support to children with special needs in the post-pandemic era also presents a unique and new set of challenges. During the COVID-19 pandemic, we saw an exponential rise in programs supporting disadvantaged children. Their problems often relate to many aspects such as family, economy, culture, etc. As such, we must integrate resources from the education and other departments when supporting disadvantaged children to prevent overlapping, excessive bureaucracy, and waste of public resources. Only then will we be able to secure long-term support for vulnerable children.

To such ends, governments should collect empirical data and develop coherent and complementary action strategies to overcome inequalities from a comprehensive view. Many effective strategies are derived from partnerships between education departments and internal/ external partners as well as sharing of best practices. Policymakers must keep an open mind for any support measures that could strengthen resilience in vulnerable children. It is therefore important to empower educators to adopt innovative actions, collect empirical data, and ensure all new investments or termination of existing measures are grounded in empirical data.

**Cultivate self-regulation in children to strengthen their sense of sense and drive their own learning**

The COVID-19 pandemic has given people deep insight into the importance of self-regulation in learning in children. Governments and societies are becoming more conscious of the fact that we cannot protect our children irrationally from damage from changes in the environment. In an increasingly uncertain world, children need to understand the landscape of the 21st Century, acquire socio-emotional skills, and the ability to transform and maintain levels of happiness and mental health to adapt to the challenges of the present and future. This means that strengthening resilience in children requires fostering self-regulation first, as it can strengthen their sense of self and inspire them to become drivers for choosing and taking action, this is what we refer to as agency.

The self-regulation skills of children are impacted by a complex and interrelated set of personal and environmental factors. From an

educational standpoint, learning socio-emotional skills can help them develop self-regulation skills. In addition, children must also develop the ability to transform, which includes critical thinking, a growth mindset, creativity, open minds, and accountability. These abilities can help children reduce biases and negative or wrong decisions so that children have more agency in the face of crisis and are more proactive in responding to uncertainties in their lives[132].

A child's ability to self-regulate is also closely tied to their happiness and mental health, which are important during childhood and puberty. Children with agency are more likely to live happy lives and explore their potential to contribute positively to society. As such, policymakers should prioritize measures supporting internal growth, including socio-emotional skills, the ability to change, happiness, and healthy emotional development among education policies to help children strengthen self-regulation skills and develop learning agency.

### Regularly and systematically listen to children's voices

After the pandemic, governments should value children as different world actors. Children are not only recipients of education, but also actors in families, schools, and communities. Listening to the firsthand experiences of children is conducive to shaping diverse learning experiences that can better satisfy the practical needs, interests, and expectations of children.

For example, Estonia uses regular, systematic, and large-scale surveys to learn more about student perspectives. Estonia also uses data from student satisfaction surveys to improve schools and teachings. Estonia's approach aims to give students a greater voice to enhance student agency and ensure that teachers and other decision-makers have a better understanding of students' circumstances. In Korea, the government is collecting student feedback before recent curriculum reforms to ensure that courses and activities align with student interests and needs (please see Chapter IV).

Supporting the development of cognitive and non-cognitive skills in children and systematically encouraging children to voice their opinions are helpful in strengthening resilience in children. A critical factor that allows children to successfully participate in society is the ability to express their opinions confidently and convey their needs and feelings. Additionally, many young people are now joining populist movements on social media, making it a priority that we listen to our students and foster trust in public institutions and democratic systems from a very young age. Giving children more say

and inviting children to participate in improving policies for learning environments and education systems are also conducive to the planning, formulation, and assessment of policies. Children have unique insight into their needs and experiences. Listening to the voices of vulnerable children during a time of crisis is especially important as they are more likely to have complex needs.

### Increase the sense of belonging in children towards the broader learning environment and cultivate children into responsible digital citizens

Remote education experiences during the pandemic show that student attendance and participation when learning online are both important factors impacting learning quality. Remote education also presents new risks to children such as excessive screen stimulation, cyberbullying, and scams. If used appropriately, however, digital platforms can provide opportunities for children to interact and work together, which can improve learning outcomes in students.

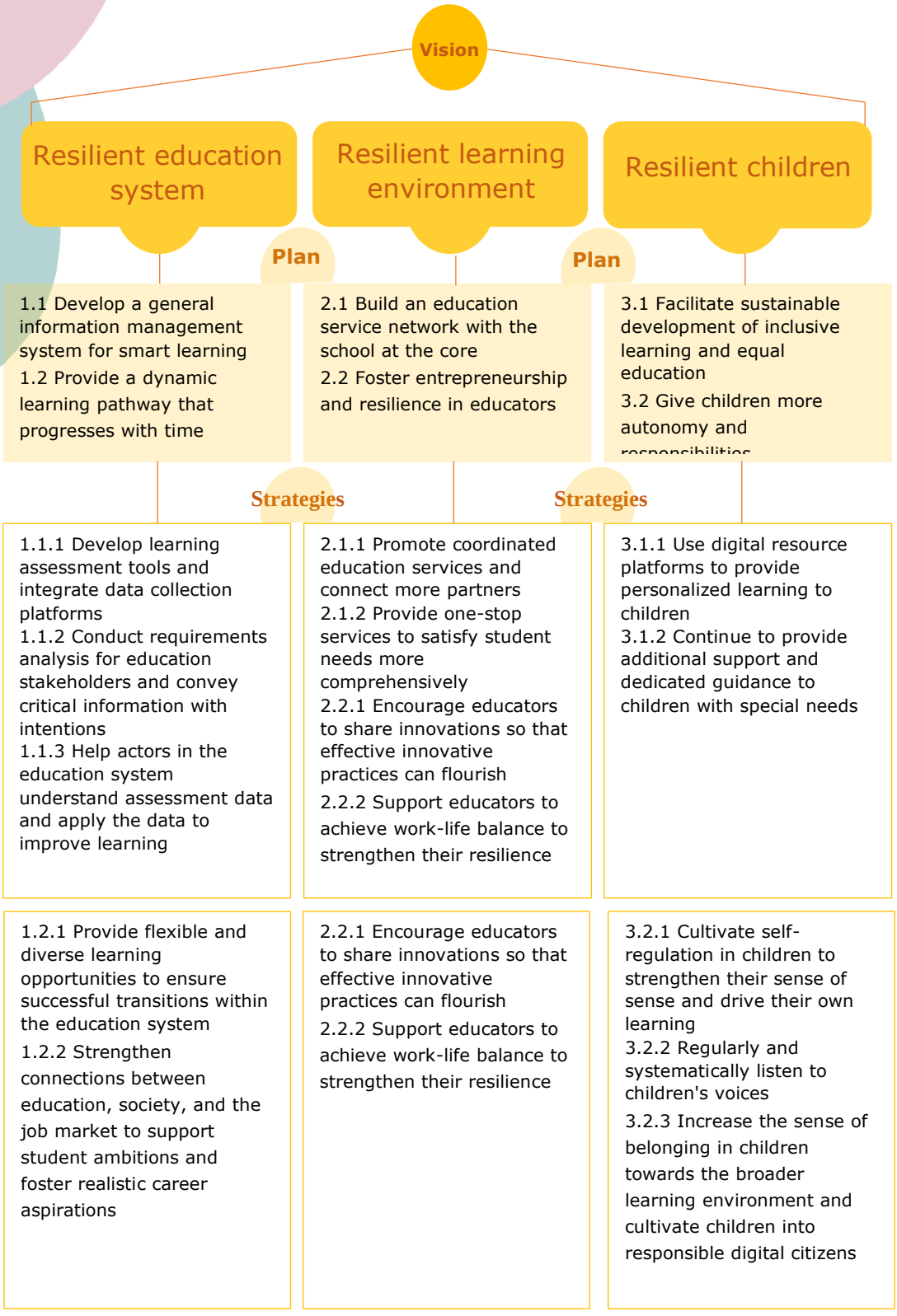
In the post-pandemic era, teachers and schools must help students become responsible digital citizens and enhance their understanding of the risks and opportunities provided by digital technologies. Schools must ensure continued interactions between students and teachers during remote learning environments and ensure that teacher's ability to proactively guide children's behavior in digital spaces and interact with parents through various channels.

As such, teachers need to be able to replicate the discipline and learning atmosphere found in traditional classrooms in digital spaces to facilitate active interactions between children, empower children to understand the functions and values of digital learning and give them a greater sense of belonging to their broader learning environment. This can increase learning motivation and accountability in students, reduce risks of dangerous and antisocial behavior, and minimize risks of skipping classes or dropping out. Policymakers must build systems to prevent cyberbullying and continue to monitor the impacts of these measures on learning environments.



## Section V Conclusion

The COVID-19 pandemic has exposed the most vulnerable sides in global education and shown the extraordinary potential of education actors to innovate. In the post-pandemic era, we desperately need to take real action and use educational innovation as a starting point to continue promoting education transformations. The future is decided in the present, by the reforms and innovations that we make today. Education transformations and visions made in the present day will have profound impacts on the future of education. Yet we cannot build a vision for the future without empirical evidence. Given this understanding, this whitepaper has constructed a "Multi-system Framework to Make Taiwan Education More Resilient" (Figure 6-2). The framework aims to serve as an answer to the challenges and opportunities in the post-pandemic era and provide critical education conducive to the formulation of education policies to strengthen resilience in education systems, learning environments, and children.




6-2 Multi-system Framework to Make Taiwan Education More Resilient

There are three visions, six plans, and fourteen strategies in the "Multi-system Framework to Make Taiwan Education More Resilient" The first vision is to create a resilient education system. A resilient education system enables countries to pursue social and economic prosperity and helps people live productive, happy lives. To such ends, we've proposed two priority plans and five strategies. Firstly, we must strategically develop a general information management system for smart learning to strengthen the collection of learning data and communication of critical information, ensuring both can be practically applied. We can use three strategies to ensure education actors are able to collect, communicate, and use this information to proactively respond to an ever-changing education ecosystem: 1. Develop learning assessment tools and integrate data collection platforms; 2. conduct requirements analysis for education stakeholders and convey critical information with intentions, and 3. help actors in the education system understand assessment data and apply the data to improve learning. Secondly, we must consider weaknesses in the education system's linear learning pathway where we have a standardized starting point and end point to provide children with dynamic learning pathways that adapt to evolving times. Two strategies can be adopted so that learning pathways in education systems are given sufficient flexibility: 1. Provide flexible and diverse learning opportunities to ensure successful transitions within the education system and 2. strengthen connections between education, society, and the job market to support student ambitions and foster realistic career aspirations.

The second vision is to create a more resilient learning environment. A resilient learning environment can facilitate more diverse and meaningful learning for education actors. We have thus proposed two priority plans and four strategies for the second vision. First, we must prevent creating an island out of the school and strive to create an education services network expanding around the school to create comprehensive, in-depth, and long-term partnerships. We can use two strategies to bring learning environments outside of school campuses and build a sprawling education services network: 1. Promote coordinated education services and connect more partners and 2. provide one-stop services to satisfy student needs more comprehensively. Secondly, we must value people and processes, fostering entrepreneurship and resilience in educators, empowering them to adapt to local contexts, and giving them the authority to adjust how strategies are implemented. There are two strategies that can be adopted to show that we value our educators: 1. Encourage educators to share innovations so that effective

innovative practices can flourish and 2. support educators achieve work-life balance to strengthen their resilience.

The third vision is to foster more resilient children. A resilient child can adapt to any task and environment, using it as an opportunity to explore their potential. To such ends, we've proposed two priority plans and five strategies. First, we must offer inclusive learning and equal education so that children can leverage opportunities from learning environments to create their own opportunities. We can use two strategies to ensure that learning opportunities are inclusive and equal: 1. Use digital resource platforms to provide personalized learning to children and 2. continue to provide additional support and dedicated guidance to children with special needs. Secondly, we must give children more autonomy and responsibilities so that they can transfer between learning tasks and environments and learn proactively. We can use three strategies to help children connect with multiple worlds and strengthen their cognitive and socio-emotional skills so that they can explore their full potential: 1. Cultivate self-regulation in children to strengthen their sense of sense and drive their own learning; 2. regularly and systematically listen to children's voices, and 3. Increase the sense of belonging in children towards the broader learning environment and cultivate children into responsible digital citizens.

In the post-pandemic era, our education systems and learning environments are becoming more resilient to ensure modernization in an ever-changing environment. It also provides the agility required for education actors to succeed and helps children learn about the world they live in and strengthens their cognitive, social, and emotional resilience in students. This requires public policy to look at

the multiple futures of education at a multi-system level and time things wisely.

Experiences from the COVID-19 crisis have shown us that changes and disruptions may be sudden, reminding us that schools are the spiritual fortresses helping people explore their potential and that education is the ticket to social mobility. While capitalizing on this incredible opportunity for education transformation and looking into the future of education, we must also consider how we can build a healthier relationship with our natural ecosystems. As such, we must remain humble as outline the risks and opportunities before us and reimagine how education can reshape the future of the human race. This report - White Paper on Children's Education: Education Transformation & Outlook After the Pandemic An Overview of Education in Taiwan - demarcates the dawn of the post-pandemic era and signals profound changes in education. Education in the future will no longer be a continuation of education in the past, it will become more resilient and join hands with our future generations into a better, fairer, and happier future.





# Appendix

物不可以窮也，故受之以未濟。終焉。

《易經．序掛傳》

# Appendix

**臺灣教育概況**

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