

# **Trends and Issues of Digital Learning in the Hong Kong Special Administrative Region**

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Kam Cheong LI<sup>1</sup> and Jessie Ming Sin WONG<sup>2</sup>

<sup>1</sup>Dean, School of Open Learning, and  
Director, Institute for Research in Open and Innovative Education, and

<sup>2</sup>Assistant Professor, School of Education and Languages,  
Hong Kong Metropolitan University,  
Hong Kong

## Abstract

The Hong Kong Special Administrative Region (HKSAR) government recognizes the importance of Digital Learning (DL) in nurturing future-ready citizens, and has taken steps to promote its adoption in the K-12 education system. The first official strategy document for promoting DL was published in 1998, with a focus on establishing physical infrastructure such as desktop computers. However, the third strategy document in 2008 shifted towards a more techno-centric and human-centric approach to integrating information technology into learning and teaching. A more recent strategy document aimed to equip students with the skills to become self-directed learners and to develop and integrate new pedagogies with existing ones. DL in Hong Kong K-12 education reached the stage of “Digital Transformation” as stated by Luo and Wee (2021) over a decade ago. The features of DL among K-12 students in Hong Kong include a high degree of digital competence and engagement in online activities for schoolwork, leisure, and social networking purposes, the nurturing of higher-order thinking skills, as well as the encouragement of parental and family involvement in DL by the government. Trends in DL in Hong Kong include the encouragement of more sophisticated applications of DL, increasing autonomy in DL, the ongoing emergence of new DL initiatives by schools, more intensive teacher training and competence, and ongoing curriculum transformation. However, this chapter also identifies several issues in K-12 education related to DL, including ethical considerations and consequences of unethical use of digital technology, adverse effects of digitalization, challenges in assessments for DL, the widening digital divide, and a lack of long-term commitment by the government. It concludes by suggesting that a balanced and sustainable approach to DL is necessary to address the challenges and leverage the opportunities presented by the digital world to provide high-quality education for all.

**Keywords:** digital learning, Hong Kong, digital transformation, K-12 education

## Introduction

In the bustling metropolis of Hong Kong, with a population of 7.4 million, basic education covers grades 1 to 12, and the government provides free education for K to 12. The government also supports tertiary education. This paper focuses solely on K-12 education.

### Structure of the Hong Kong schooling system

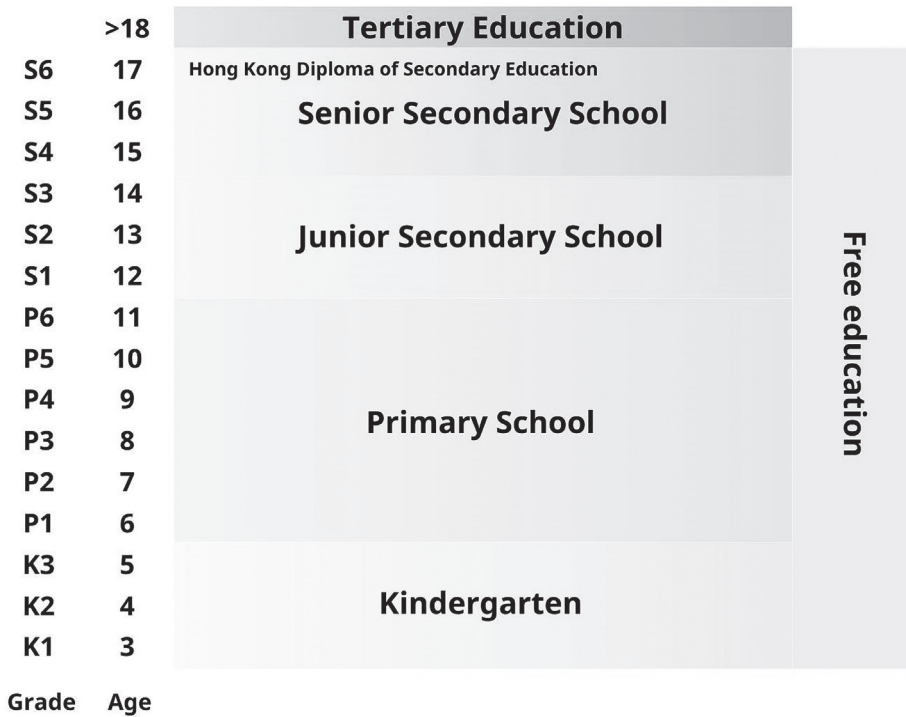
This section provides an overview of the three major levels of K-12 education in Hong Kong: kindergarten, primary, and secondary education.

In Hong Kong, while kindergarten attendance is not compulsory, almost all 3- to 6-year-olds attend kindergarten (Wong, 2015, 2022). There are over 1,000 kindergartens in Hong Kong, all of which are private institutions. Around 80% of these institutions are non-profit-making kindergartens that adopt local curricula, and nearly 97% of local kindergartens join the government's "Kindergarten Education Scheme," offering free half-day services to children (Education Bureau, 2017; Wong & Rao, 2022). Whole-day services are also available but with additional fees. Most kindergartens operate with three levels: K1 (nursery class for 3- to 4-year-olds), K2 (lower kindergarten class for 4- to 5-year-olds), and K3 (upper kindergarten class for 5- to 6-year-olds). Those that join the Kindergarten Education Scheme must follow the government's Kindergarten Education Curriculum Guide, which emphasizes all-round development, including ethics, intellect, physique, social skills, and aesthetics. The curriculum places child-centredness as its core and aims to foster children's interest in learning, positive values and attitudes, self-confidence, and self-care abilities (Curriculum Development Council, 2017a). To achieve five developmental objectives — "Moral Development," "Cognitive and Language Development," "Physical Development," "Affective and Social Development," and "Aesthetic Development" — the Kindergarten Education

Curriculum is designed with six learning areas, namely, “Physical Fitness and Health,” “Language,” “Early Childhood Mathematics,” “Nature and Living,” “Self and Society” and “Arts and Creativity.” The “Nature and Living” learning area includes raising awareness and appreciation of technology and ways of using it to improve modern life.

Hong Kong’s primary and secondary education system consists of four types of schools, with each stage lasting for six years in the public sector. The first three are government schools, aided schools, and Caput schools, which are fully subvented by the government and are run by religious, charitable, or clan organizations. The fourth type, Direct Subsidy Scheme schools, receives funding based on enrolment. Private schools are also available. As of September 2021, approximately 279,700 children were enrolled in 456 public sector primary schools, while around 254,900 students attended 392 public sector secondary schools (Education Bureau, 2022a). The government aims to provide free education to all children, and offer balanced and diversified school education to construct their knowledge, skills, and values for further studies or work. It also aims to promote whole-person development, lifelong learning capabilities, and proficiency in biliterate and trilingual communication among students (Secretary for Education, 2022). One of the government’s priorities is to promote the use of IT in learning and teaching at the primary school level (Secretary for Education, 2022). The latest update on the learning goals of primary education highlights the importance of using information and IT in a rational and responsible manner (Curriculum Development Council, 2022). Secondary education in Hong Kong, on the other hand, aims to provide a balanced education to meet the diverse needs of students, enabling them to develop knowledge and acquire generic skills to contribute to Hong Kong and the nation, and to become responsible citizens (2019). The following diagram illustrates the Hong Kong K-12 schooling system.

**Figure 1** Schooling System of Hong Kong

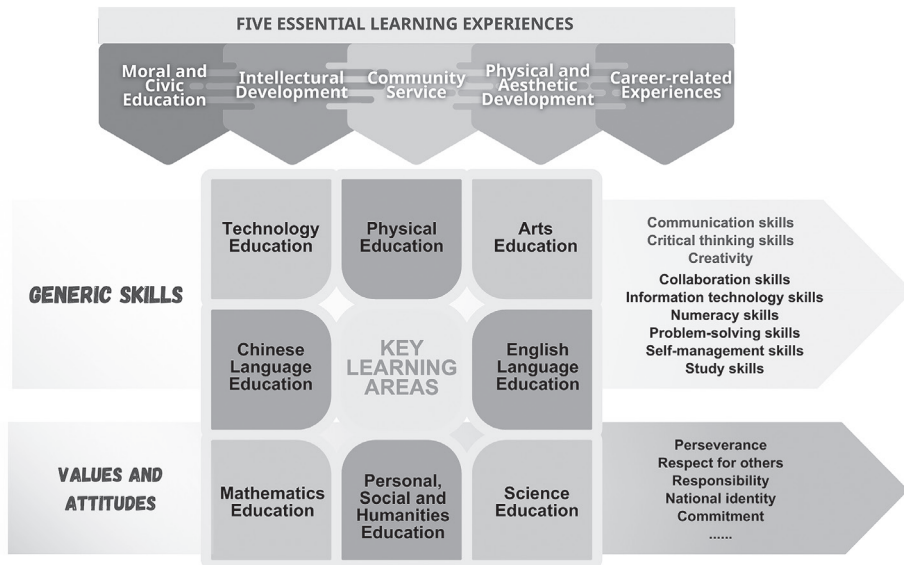


In other words, the Hong Kong government practically provides 15 years of free education: three years of non-compulsory half-day kindergarten education, nine years of compulsory primary to junior secondary education, and three years of non-compulsory senior secondary education. Tertiary education takes a variety of forms such as higher diploma, associate degree, and Bachelor’s degree. As this chapter focuses on K-12 education, the tertiary education system in Hong Kong has been omitted from the above figure; details can be found on the Education Bureau’s website at <https://www.edb.gov.hk/en/education/system/postsecondary/index.html>.

The curricula from kindergarten to senior secondary school aim at fostering students’ whole-person development, and lifelong and self-directed learning capabilities (Education Bureau, 2022a). Despite not directly focusing on

digital learning (DL), the diagram below shows that technology education is included as one of the eight Key Learning Areas (KLAs).

**Figure 2** The Hong Kong School Curriculum



Note. Adapted from Curriculum Development Council, 2014.

## Digital transformation (DX) and current stage in K-12 schools

Luo and Wee (2021) proposed a framework for understanding the different stages of digital learning (DL), identifying three distinct phases. The first stage is Digitization, which involves the conversion of non-digital resources and information into digital format. The second stage is Digitalization, where traditional learning processes and interactions are transformed into their digital equivalents. Finally, the third stage is Digital Transformation (DX), representing the most advanced and innovative phase, characterized by a comprehensive integration of digital technologies to transform education. In the DX stage, digital technologies are used to support strategic decision-making,

improve efficiency, and create new learning opportunities, requiring a deep understanding of the school's goals, culture, and processes. This advanced stage also leverages emerging technologies, such as data analytics, artificial intelligence, and others.

Hong Kong's early childhood education has already moved beyond the first stage of Digitization and is currently in the midst of the second stage of Digitalization, where appropriate integration of IT equipment and electronic media is encouraged to assist learning. In primary and secondary education, DL in Hong Kong has also advanced beyond the first two stages, as described in the *Consultation Document on the Third Strategy on Information Technology in Education* (Education Bureau, 2007). The government's e-Textbook Market Development Scheme, launched in 2012, received numerous applications from K-12 schools covering a range of subjects, including Chinese Language, English Language, Mathematics, General Studies, Computer Literacy, Putonghua, Life and Society, and Physical Education. The scheme's popularity and wide coverage across primary and junior secondary levels reflect the enthusiasm of K-12 schools for adopting e-textbooks.

About a decade ago, the Hong Kong government developed plans to enhance already digitalized e-learning resources, develop new pedagogy using digital technologies, and integrate them with existing pedagogy, as described in the 2014 consultation document by the Education Bureau. This document also emphasized capacity building for teachers' professional development in digital education and the involvement of parents and other stakeholders in sustainable development. The principles of learner-focused digital education, stepwise planning, and ongoing curriculum renewal were also introduced in the document. These initiatives demonstrate Hong Kong's commitment to innovative and disruptive education transformation, incorporating digital technologies to enhance teaching and learning. With the adoption of emerging technologies, Hong Kong's DL has progressed to the DX stage, as described in Luo and Wee's (2021) framework.

Several innovative and disruptive education transformation projects in Hong Kong K-12 schools have also contributed to the DX stage. For example, Tavernier (2016) successfully applied the Book Creator, an iPad app, to help 3- to 5-year-old children in kindergartens complete assignments and create sophisticated digital artifacts. Khoo (2016) reported that digital text reading was effective in promoting preschoolers' construction of mathematical knowledge. So and Chen (2018) applied e-learning to Primary 3 students, demonstrating positive changes in their conceptual understanding and evidence-use skills. These individual projects provide further evidence of Hong Kong K-12 education being in the DX stage.

In summary, Hong Kong's DL has advanced through the three stages of Digitization, Digitalization, and DX, characterized by a comprehensive integration of digital technologies to transform education. The government's policies, curriculum documents, and innovative projects all demonstrate a commitment to innovative and disruptive education transformation in Hong Kong's K-12 schools.

## **The Status of Digital Learning**

### **Contexts of digital learning**

The Education Bureau of the Hong Kong government provides funding and resources to support educational institutions at all levels in implementing online learning (Hong Kong Legislative Council, 2020). In 2014, the gross student-to-computer ratios in the primary and secondary school sectors were 4.54:1 and 4.21:1, respectively (Education Bureau, 2014), indicating a high level of student accessibility to computers in schools in Hong Kong.

Hong Kong's primary and secondary school students have also demonstrated



a high level of digital literacy. In 2018, Hong Kong ranked fourth in the digital reading literacy achievement of 15-year-olds in PISA, after China, Singapore, and Macao (OECD, 2019). This ranking improved from third place in 2012 (OECD, 2019). These results reflect the effectiveness of Hong Kong's education system in promoting digital literacy among students. This part introduces the major government policies on DL in Hong Kong K-12 schools and how they were influenced by COVID-19.

### ***DL policies, projects/programs, and strategies***

The Hong Kong government has a long-standing commitment to promoting information technology in education. The first strategy for IT education in primary and secondary schools was implemented in 1998, followed by the second and third strategies in 2004 and 2008, respectively. The latest strategy, the fourth one, was promulgated in the 2015/2016 school year.

The first strategy, *Information Technology for Learning in a New Era: Five-year Strategy — 1998/99–2002/03* (Education and Manpower Bureau, 1998), aimed to develop students' information processing capabilities, connect them with the world, and transform schools into innovative learning institutions for nurturing student motivation and creativity, as well as to help students form a life-long learning attitude and capacity. The strategy emphasized infrastructure building, such as installing equipment and developing digital learning resources, as well as creating a community-wide culture conducive to using IT for learning.

The second strategy, *Empowering Learning and Teaching with Information Technology from 2004 to 2007* (Education and Manpower Bureau, 2004), focused on empowering teachers and students with DL, enhancing e-schools and e-leadership, and enriching digital learning resources, IT pedagogy development, and community supporting IT in education. This strategy placed more emphasis on human capacity development for DL, both on an individual level

and at the school level.

The third strategy, outlined in the consultation document by the Education Bureau (2007), highlighted two trends that were shaping the learning environment. First, there was a growing use of web-based collaboration, including the use of blogs, wikis, and RSS feeds. Second, mobile learning was becoming increasingly popular, enabling learning anywhere and anytime. The consultation document provided examples of innovative educational technologies, such as classroom response systems, portable e-whiteboards, text message alerts sent to mobile phones, multimedia museum guides, and ubiquitous language learning with mobile phones. The government was proactive in integrating IT into K-12 learning and teaching, with the strategy focusing on collaborative, contributory, and creative learning, supported by digital technologies.

The official report of the *Third Strategy on Information Technology in Education: Right Technology at the Right Time for the Right Task* (Education Bureau, 2008) shifted the focus from technical to human aspects of the use of IT in education, aiming for successful integration of IT into education. The strategy focused on collaborative, contributory, and creative learning, which aligns with the DX elements in Luo and Wee's (2021) digital development framework.

The review surveys conducted in 2010 and 2012 involving all school sectors showed that over 70% of primary, secondary, and special schools submitted their responses online (Education Bureau, 2012). The survey found that IT infrastructure had been well set up in schools, including classrooms and internet connections, and schools were increasingly adopting mobile devices such as tablets. Schools were actively adopting IT in their teaching, with over 80% of schools having plans to improve students' learning outcomes. Interactive learning activities using IT had replaced traditional digital resources, indicating strategic decisions and innovative education transformation in the DX stage, as defined by Luo and Wee's (2021) framework.

The Hong Kong government's commitment to promoting information technology in education continued with the promulgation of *The Fourth Strategy on Information Technology in Education* (Education Bureau, 2015). This strategy built upon the earlier strategies and aimed to develop self-directed learning, problem solving, collaboration competency, computational thinking competency, creativity, innovation, entrepreneurship, ethics in IT use, life-long learning, and whole-person development. The strategy included many innovative and disruptive education transformations, as well as strategic decisions, with the overarching aim of unleashing students' power of learning to learn, and enabling them to excel.

The aims of the strategy were to be achieved in various ways, including enhancing schools' infrastructure and operation mode, improving the quality of e-learning resources, enriching the free resources on the Education Bureau's One-Stop Portal for Learning and Teaching Resources, and sharing resources among teachers. The strategy also involved enabling Single Sign-on and integrating e-learning platforms, renewing the curriculum, transforming pedagogical and assessment practices, building professional leadership, capacity, and communities involving parents, stakeholders, and the community of practice, and sustaining a coherent development of IT in education.

The Education Bureau's (2014) *The Fourth Strategy on Information Technology in Education – Consultation Document* indicated the Hong Kong government's determination to tap into the power of IT and equip students to be self-directed learners with talent and virtue. This reflects the government's commitment to implementing DX almost a decade ago by developing new pedagogy using digital technologies and integrating them with existing pedagogy. The document also proposed capacity building for teachers' professional development in digital education and parents and other stakeholders, as well as learner-focused digital education, stepwise planning, and ongoing curriculum renewal. The Education Bureau encouraged the use of flipped classrooms,

social network platforms, and technology for interaction, active participation and engagement. The progress of the implementation of this consultation since 2015 was smooth (Census and Statistics Department, 2022b).

The Secondary Education Curriculum Guide Booklet 6D, entitled *Information technology for interactive learning: Towards self-directed learning*, released in 2018 (Education Bureau, 2018), was based on the fourth strategy. This booklet provides further evidence for Hong Kong K-12 schools being in the third stage of DX, as defined by Luo and Wee's (2021) framework. In the existing curriculum, IT was not only used for learning knowledge and skills, but was also a means of building up one's capacity for self-directed learning through interactive learning activities. Self-directed learners were "able to identify their learning needs, formulate goals, and choose resources and strategies for learning" (Education Bureau, 2018, p. 2).

Kong et al. (2014) offered a concise and informative account of the historical development of e-learning in Hong Kong's K-12 education, summarizing the key trends in DL in the region. According to their analysis, there has been a high awareness of the importance of e-learning in the Hong Kong community since the 1990s, and the Hong Kong government has emphasized "Information Technology for Interactive Learning" as one of the four key tasks in local curriculum development. "IT Skills" were included among the other eight generic skills in the curriculum reform in the 2000s. Kong et al. (2014) identify three documents that marked three distinct stages of information and communication technology (ICT) development for K-12 schools in Hong Kong up to 2013, before the promulgation of the fourth strategy in 2014.

The first stage, from 1998 to 2003, began with the implementation of the *Information Technology for Learning in A New Era: Five-year Strategy—1998/99–2002/03* by the Education and Manpower Bureau (1998), which aimed to build ICT infrastructure on school campuses (such as desktop computers and campus-wide networks), prepare teachers for integrating ICT into

their teaching, and encourage community involvement, such as the involvement of parents and tertiary educational institutions. This stage also involved the development of digital learning resources and the provision of ICT facilities in community centers.

The second stage, from 2004 to 2007, began with the release of the second strategy on *Empowering Learning and Teaching with Information Technology from 2004 to 2007* (Education and Manpower Bureau, 2004). This stage focused on promoting students' proper and ethical use of ICT in daily life, encouraging e-learning pedagogical innovations, and for example, through the support of pilot schemes, reviewing resources for e-learning and enhancing training for e-leadership through the organization of activities such as public seminars.

The third stage, covering the period 2008-2013, focused on using the right technology at the right time for the right task, as set out in the *Third Strategy on Information Technology in Education: Right Technology at the Right Time for the Right Task* promulgated by the Education Bureau (2008). The development of this stage was based on three themes. The first was the development of an online repository with curriculum-based digital resources, categorized by subjects, grades, and themes for easy retrieval, search and sharing. The second theme was the development of e-textbooks as self-contained curriculum packages. According to Kong et al. (2014), the Education Bureau promoted school-based ICT education planning through its provision of a four-component resource pack, requiring all schools to develop their own school-based e-learning plans with the support of a one-off grant for infrastructure procurement.

The high priority the Hong Kong government has placed on digital learning in primary and secondary education is evident from the frequent reiteration of digital literacy in various supporting documents. For instance, the pilot version of the *Primary Education Curriculum Guide* released in 2022 emphasizes

the need to nurture students' media and information literacy (Secretary for Education, 2022). Similarly, an update on the secondary education curriculum reiterates the importance of career and life planning, given the rapidly-evolving nature of the workplace and the emergence of new jobs in the technology-driven economy (Curriculum Development Council, 2017b, 2021).

In 2000, the Curriculum Development Council of the Hong Kong government promulgated guidelines for schools to organize learning and teaching activities aimed at developing students' capability of using IT. The guidelines proposed five stages covering Primary 1 to Secondary 7, with learning targets involving knowledge, skills and attitude for each stage. Broadly speaking, the stages begin with basic computer operation, awareness of the use of IT in daily life, an interest in using IT to become frequent and sophisticated users of IT, being able to select and employ appropriate IT tools for specific purposes, and being able to critically evaluate the usefulness of emerging IT tools. Although the guidelines focused on students' proficiency in IT skills rather than digital learning, they indicate the Hong Kong government's awareness and determination to advance digitalization in the formal curriculum.

In 2005, the Education and Manpower Bureau published a document on an information literacy framework for the capacity building of learning to learn for Hong Kong K-12 students. This document aimed to complement the earlier curriculum reform document, focusing on developing students' independent learning capability, lifelong learning and whole-person development. The framework defines an information literate person as "one who knows why and how to use information for achieving purposes throughout his/her lifetime... [and who acts] ethically by not plagiarising another's work when presenting the research to an audience" (Education and Manpower Bureau, 2005, p. 7). In addition to learning autonomy and social responsibility, this framework focuses on developing students' capacity for reflective learning and "the necessary skills to comprehend, locate, analyze, critically evaluate and synthesize

information and apply their knowledge to inform decisions and problem-solving” (p. 12). This means that higher-order cognitive dimensions, such as metacognition and problem-solving skills and values, are covered. The document recommends a generalized assessment method on both cognitive and affective domains and a school-based implementation of information literacy. The above document provides evidence that DL in Hong Kong K-12 education has long developed beyond the stage of merely mastering IT knowledge and skills. The concerns since the 2000s have shifted to wider coverage, including metacognitive, affective, value and sociocultural aspects.

### ***DL implementation in K-12 schools***

Today, DL has been implemented at all levels and in all types of K-12 schools in Hong Kong, including kindergartens, primary schools, and secondary schools. The government has provided support for schools to adopt DL, including the provision of infrastructure and resources, teacher training, and curriculum development. DL has been implemented in all learning areas, including language, mathematics, science, social studies, and the arts.

However, there are areas where DL has been implemented with special emphasis. For example, it has been implemented more extensively in senior secondary schools, where students are preparing for public examinations and further studies. In these schools, DL has been used to provide more personalized and flexible learning opportunities to meet the diverse needs of students, including the provision of online courses, e-textbooks, and other digital resources (Education Bureau, 2018).

Another area where DL has been implemented with special emphasis is in language learning, particularly for the English and Chinese languages. In recent years, the government has launched several initiatives to promote the use of digital technologies in language learning, including the provision of language learning apps, online language courses, and digital reading materials. These

initiatives aim to enhance students' language proficiency, improve their reading and writing skills, and promote their interest in language learning.

The main reasons for the special emphasis on DL implementation in senior secondary schools and language learning are the increasing demand for personalized and flexible learning opportunities, the need to prepare students for public examinations and further studies, and the importance of language proficiency in the globalized world.

### ***The impact of COVID-19 on DL***

The COVID-19 pandemic has had a significant impact on DL in Hong Kong as in other cities across the globe. The strong DL infrastructure of Hong Kong enabled K-12 education to rapidly transform itself in response to the pandemic. In a longitudinal research study on around 2,000 K-12 students in Hong Kong from 2019 to 2021, Law et al. (2022) noted that the Hong Kong government mandated longer periods of intermittent school suspension, resulting in a radical change from face-to-face to online teaching. This change substantially increased students' time spent on digital technology, both during and after school time, contributing to their development in digital literacy. As Xia et al. (2023) pointed out, Hong Kong schools, like most schools across the globe, could not escape the influence of COVID-19 on school closure.

The Hong Kong government was highly aware of the need for the continuation of education despite school closure. In 2020, the Education Bureau (2020) offered funding to assist K-12 schools in Hong Kong to implement e-learning. Moorhouse and Wong (2022) gathered the views of English language teachers through an online survey and follow-up interviews on the adaptation of their instruction in response to COVID-19. The study found that teachers adopted a variety of asynchronous and synchronous digital technologies and instructional approaches not only for teaching but also for learning assessment and communication with students and parents. Another study conducted by the Hong



Kong Federation of Youth Groups (2020) reported that secondary schools in Hong Kong expressed that the COVID-19 pandemic had increased the amount of time used for e-learning, which was a global phenomenon. However, e-learning that involves interpersonal interactions was not frequently carried out. This suggests that the pandemic has underscored the need for more effective DL strategies that can accommodate the interpersonal and social dimensions of learning.

### **Digital learning infrastructure**

Hong Kong is a highly digitalized society, as reflected by the government's official figures. As of November 2022, the mobile subscription penetration rate in Hong Kong was 301.3%, with a total of 22,550,784 mobile phone subscriptions (Office of the Communications Authority, n.d.a). This shows that on average, each Hong Kong citizen owns three mobile phones. The internet penetration rate of the Hong Kong population has also steadily increased from 88.1% in 2018 to 91.2% in 2022, with a projected rate of 93.4% in 2027 (Statistica, n.d.). Additionally, almost all Hong Kong households (99.1%) were using broadband as of October 2022, and the personal computer penetration rate for businesses of all sizes was 81.0%, with a 95.7% internet usage rate (Office of the Communications Authority, n.d.b). These figures highlight the advantages and convenience that digitalization provides to service sectors such as finance, banking, and education, and enables Hong Kong to maintain its competitiveness among Asian countries (Legislative Council, 2021).

The Hong Kong government has made significant efforts to promote e-learning, including the establishment of WiFi campuses for about 1,000 public sector schools, a review of the curriculum, fostering of professional development for school leaders and teachers, and enhancing the quality of e-learning resources (Census and Statistics Department, 2022b). Compared to other regions, such as Singapore, Taiwan, and Beijing, Hong Kong's strength in e-learning for K-12 education lies in the creation of digital classrooms support-

ed by wireless networking for student-centered learning (Kong et al., 2014). Since the inception of the first five-year strategy of ICT education in 1998, there have been significant improvements in school and home access to ICT in Hong Kong (Yuen et al., 2014). A study by Law et al. (2022) found that students' ownership of a large screen device is positively related to their digital literacy among K-12 students in Hong Kong. The readily available infrastructure contributes to the high digital literacy of Hong Kong K-12 students.

Reviews of the progress of the third and fourth strategies for ICT education in Hong Kong conducted in 2010, 2012, and 2015 indicated that schools have well-established basic IT infrastructure, including classrooms and the internet, and have begun to acquire devices for mobile learning (Education Bureau, 2012, 2015). These efforts demonstrate the Hong Kong government's commitment to promoting e-learning and leveraging its digital infrastructure to enhance education.

Hong Kong has had a solid DL infrastructure for K-12 schools in Hong Kong for over a decade, as reported in the government's 2007 consultation document on the third strategy (Education Bureau, 2007). The report noted that schools had adequate hardware and software, all public sector schools had a broadband connection to the internet, and the student-to-computer ratios were comparable to countries such as the United Kingdom and the United States. Additionally, over 90% of students had access to computers and the internet at home. The report also found that major stakeholders, including school management, teachers, students, and parents, had positive attitudes toward DL. Almost 90% of primary school students and 80% of secondary school students liked to use computers to learn in class, and 85% of primary school students and 60% of secondary school students reported that they liked to use computers to learn beyond school hours. Almost 100% of primary and secondary school students claimed that they possessed knowledge of using computers, reflecting their confidence in their digital literacy. Furthermore, 60% of parents endorsed the use of IT for learning.

Despite positive attitudes towards DL, a survey found that just over 50% of teachers frequently used IT in class in 2005/06, despite the majority of teachers contending that IT could make teaching more effective, and rating themselves as confident in selecting appropriate digital resources to teach (Education Bureau, 2007). Ongoing teacher professional development on DL was included as one of the key actions to be taken in the consultative document. In the 2020/21 academic year, 10,000 primary school teachers and 9,700 secondary school teachers attended 310 IT courses organized by the Education Bureau (Census and Statistics Department, 2022b). Additionally, about 1,500 primary and 1,400 secondary school teachers attended 150 courses listed on the Web-based School Administration and Management System. The same year recorded 480 primary school teachers and 470 secondary school teachers executing duties as IT coordinators/ IT in-charge at school, and more than 1,800 secondary school teachers were teaching IT/ computer studies. With the accelerating development speed in IT in general and for K-12 teaching, more and more relevant teacher training is expected to be provided.

### **Features of digital learning**

Over the past two decades, DL among K-12 students in Hong Kong has undergone significant evolution, resulting in advanced, sophisticated, and innovative developments. Today, students possess a high degree of digital competence, enabling them to engage in online activities for schoolwork, leisure, and social networking purposes. DL in Hong Kong's K-12 education also facilitates the development of higher-order thinking skills. The government has encouraged parental and family involvement in DL, and schools have continued to introduce new DL initiatives, laying a solid foundation for the future of DL developments in Hong Kong's K-12 education. These developments are described in more detail below.

### *A high degree of digital competence increasing at a rapid pace*

The digital competence of K-12 students in Hong Kong is increasing rapidly, as confirmed by various studies and reports. For example, Law et al. (2022) conducted a longitudinal study on the digital citizenship of Hong Kong K-12 students, and found an increase in digital literacy among their participants, which allows them to engage in online activities for schoolwork, leisure, and social networking purposes. The study adopted a comprehensive framework that includes dimensions such as information and data literacy, communication and collaboration, digital content creation, digital safety, and problem solving. The study's findings indicate that digital literacy encompasses much more than knowledge and skills in technology; it also covers collaboration, creativity, safety, and problem solving. Similarly, the survey for progress review of the third strategy found that students' competencies in using technical devices had significantly improved and were comparable to those of European students (Education Bureau, 2012). The same report also describes how IT was widely used in many school subjects, and innovative, interactive, and collaborative learning adopting IT had replaced the reading of traditional digital resources.

In *The Fourth Strategy on Information Technology in Education*, the Hong Kong government pointed out that in 2015, schools in Hong Kong had already achieved an IT-rich school environment, school professional leadership and capacity, and support from community partnerships for DL (Education Bureau, 2015). These factors have contributed to the rapid increase in digital competence among K-12 students in Hong Kong.

Given the above, it is reasonable to expect that the high-speed increase in digital competence levels will continue to be a feature of DL in Hong Kong K-12 schools in the future. Students in Hong Kong are proficient in using digital tools and resources, and they are increasingly exposed to innovative and collaborative learning experiences that foster higher-order thinking skills. As DL

continues to evolve, it is likely that digital competence will become an even more crucial skill for success in the 21st century, and Hong Kong's K-12 education is well-positioned to meet this challenge.

### ***Nurturing higher-order thinking skills***

Since the implementation of the third strategy, Hong Kong's K-12 education system has placed a strong emphasis on nurturing higher-order thinking skills through DL. Problem solving, collaboration, and self-regulation have been identified as key skills that students need to succeed in the 21st century. The Secondary Education Curriculum Guide Booklet 6D, entitled *Information Technology for Interactive Learning* (Education Bureau, 2018), is an example of how DL initiatives in Hong Kong have shifted towards higher-order learning skills, such as self-directed and collaborative learning. This booklet goes beyond teaching IT knowledge and skills and provides guidance on how to integrate DL into the curriculum to foster higher-order thinking skills.

There are also emerging DL initiatives in Hong Kong that focus on specific higher-order thinking skills, such as analyzing and evaluating (Lee & Lai, 2017), abstract thinking (Kee & Zhang, 2022), decision making, and problem solving (Dawson et al., 2021). Although only the first of these projects involved K-12 students in Hong Kong, it is expected that more similar initiatives will be developed and implemented in K-12 schools with the continuous advancement of DL.

### ***Encouraging parental involvement***

Encouraging parental involvement in IT for learning and teaching has been a recurring theme in Hong Kong's K-12 education system since the announcement of the first strategy on information technology in education (Education and Manpower Bureau, 1998). The first two strategies emphasized the importance of communication between schools and parents regarding IT use for

learning and teaching. The third strategy added a new dimension of empowering parents with IT knowledge to provide guidance to their children on the ethical and legal use of IT, and to prevent them from engaging in inappropriate online activities. The fourth strategy re-emphasized the essential role of parents in the DL of their children, and recommended ongoing communication and partnership between schools and parents.

Moorhouse and Beaumont (2020) attempted to involve parents in their children's school-based digital learning of English language writing, and reported that parents were involved by viewing and liking the platform, rather than commenting. Parental involvement in digital education has also been advocated as a measure to combat the digital divide, which is the accessibility gap between those who can access computers and the internet and those who cannot (Van Dijk, 2012). Chun et al. (2023) summarized four sets of skills for the digital literacy of parents proposed by Romero (2014) to tackle the issue of the digital divide among K-12 students in Hong Kong: (1) privacy, content, and technology management; (2) communication and socio-emotional skills; (3) creative and problem-solving skills; and (4) lifelong learning to keep abreast of digital literacy skills. They also introduced the government's initiative of the task force review undertaken by the Hong Kong government on home-school cooperation on e-learning and websites for parental digital literacy enhancement.

Research has found that the digital competence of K-12 students in Hong Kong is directly related to family background and parental support (Liang et al., 2021). Therefore, the Hong Kong government advocates for strengthening parental support for their children's digital citizenship. This suggestion concurs with the importance of parental influence on children's digital learning found by Gonzalez-DeHass et al. (2022). Tan et al. (2022) conducted a study during the COVID-19 school suspension in primary and secondary schools in Hong Kong, and found that children with more parental home monitoring and support had higher self-efficacy, acquisition of digital skills, and cognitive-

emotional regulation, and were less worried about school resumption after COVID-19.

However, Reichert et al.'s (2020) survey found that only 50% of their participating K-12 students reported receiving parental support for digital learning. Given Law et al.'s (2022) findings that the digital competence of Hong Kong K-12 students is statistically significantly related to student well-being and family socio-economic status, it is essential to encourage family support in nurturing K-12 students' digital citizenship. The Hong Kong government should continue its efforts to involve parents in their children's digital learning and provide them with the necessary resources and support to enhance their digital literacy.

## **Trends and Issues in Digital Learning**

The trends identified in the use of digitalization for education resonate with the features of DL. These trends reflect a more advanced and sophisticated application of DL, with a focus on promoting autonomous and personalized learning. Additionally, there is an ongoing development of initiatives on DL, more intensive teacher training, and ongoing curriculum transformation. They are introduced below.

### **Trends in digital learning**

#### ***More sophisticated and diverse use of digital learning***

The first trend identified for Hong Kong K-12 DL is the encouragement of more sophisticated and diverse use of digital learning. This includes using DL for higher-order learning, such as metacognition, self-regulation, complex problem-solving capacity, and abstract thinking. *The Fourth Strategy on Infor-*

*mation Technology in Education* emphasizes the importance of self-directed learning, problem solving, and collaboration among learners (Education Bureau, 2015). However, Hong Kong educators should be aware that there is a wide variety of DL applications available, such as collaborative problem-solving games, self-enhancement of learning through students' self-tracking, and the use of advanced augmented/virtual reality.

To keep up with the rapidly advancing landscape of DL, new DL strategies are expected to be released by the Hong Kong government. These strategies are likely to focus on the more advanced implementation of DL for K-12 students in Hong Kong. For example, future strategies may encourage students to self-develop mobile apps for their own learning, share self-developed apps among students (YP Team, 2020), or even engage in young entrepreneurship with the support of schools and the government (Weng et al., 2022). These initiatives will allow students to develop the digital skills and competencies required to thrive in the 21st century.

### ***Promotion of autonomous and personalized DL***

While the third strategy (Education Bureau, 2008) focused on collaborative, contributory and creative learning, the fourth strategy (Education Bureau, 2015) took a step forward by aiming to strengthen students' capacity for self-directed learning and learning autonomy (p. 58). Research has shown that learning autonomy is positively related to digital literacy (Chiu et al., 2022), and DL requires a high level of learner autonomy while fostering it (Kay-Jones & Janvier, 2022). Personalized learning, such as online learning, has been found to be effective in resolving many problems, such as information overload (Chen et al., 2021).

Despite the importance of learner autonomy and personalized learning, they are still not widely addressed in the official documents of the Hong Kong government, particularly the four DL strategies introduced so far. However, with



the increasing sophistication of educational technology and the emergence of new learning needs, it is expected that the Hong Kong government, schools, students, parents, and the community will become more aware of the importance of these two concepts in the future development of DL.

### ***Ongoing development of initiatives on DL***

As introduced at the beginning of this chapter, Hong Kong K-12 education has seen the development and implementation of initiatives on innovative DL. This trend is set to continue, given the emphasis on innovative learning and teaching by the Hong Kong government. Several recent initiatives implemented in Hong Kong K-12 schools are worth highlighting.

Weng et al. (2022) reported on the effectiveness of real-world problem-based maker education on face masks during the COVID-19 pandemic in promoting student creativity and entrepreneurship in a K-12 school in Hong Kong. Qualitative data showed that students' creativity and entrepreneurship were scaffolded in various ways throughout the learning cycle. Lee et al. (2022) reported on the positive outcome of a project on informal digital learning of English in a secondary school in Hong Kong, finding that personal enjoyment played a larger role in students' willingness to communicate in English than social enjoyment or teacher appreciation. Another empirical study of 330 grade 8 students found that teacher involvement was the most influential predictor of behavioral, cognitive, and emotional engagement in digital learning environments (Xia et al., 2023).

These studies suggest that ongoing research and initiatives on DL in Hong Kong K-12 education are likely to lead to further advancements. As the understanding of DL among K-12 students increases, new opportunities for innovative and effective teaching and learning will emerge. The Hong Kong education system can continue to foster these developments by promoting and supporting research, providing professional development opportunities for

teachers, and embracing new technologies and pedagogies that enhance the learning experience for all students.

### ***More intensive teacher training***

Teachers play a crucial role in effectively integrating DL into the learning and teaching process to create positive impacts, as reiterated in the official documents of the Hong Kong government (e.g., Education Bureau, 2007). The third strategy (Education Bureau, 2008) prescribes seven success factors for effective integration of IT into learning and teaching for teachers, including continuous professional development, sharing of pedagogical practices, IT-enhanced teaching resources, student-centered learning, catering for learner differences, enjoyable learning experiences, and promoting students' lifelong learning.

Research has consistently shown that teacher support is the strongest predictor of student engagement in terms of cognition, behavior, and emotion (Xia et al., 2023). As suggested by Chong and Pao (2021), teachers can be expected and required to undergo more extensive and specialized training on digital learning with the increasing variety and number of policies and initiatives of the Hong Kong government on DL. This is especially true as the successful integration of IT into learning and teaching heavily depends on teachers' instruction (Moorhouse & Wong, 2022). Schools that participated in the research conducted by the Hong Kong Federation of Youth Groups (2020) expressed that teacher training is a key factor in the successful implementation of e-learning initiatives.

### ***Ongoing curriculum transformation and development of school plans***

The curriculum reform surveys conducted by the Curriculum Development Council (2001) and the consultation document of the third strategy (Education Bureau, 2007) revealed that school heads and teachers regarded IT in education as a top means that contributes to the progress in implementing curricu-

lum reform. Key stakeholders, including school principals, teachers, parents, tertiary institutions' centers of IT in education, and the IT sector, have emphasized that the seamless integration of IT into education requires assimilating IT into the teaching of key learning areas (KLAs) of the curriculum. The fourth strategy provided guidelines on curriculum transformation for the effective use of IT in learning and teaching, and specific strategies for individual curricula.

The Hong Kong government has incorporated common teaching and learning strategies for using IT, and specific strategies for individual curricula into the KLA curriculum guides for basic education and the New Senior Secondary curriculum and assessment guides. However, teachers may face workload and time constraints, and are not always able to select and integrate digital resources into their lesson plans (Education Bureau, 2007).

To address this issue, the third strategy (Education Bureau, 2008) included the provision of assistance for drawing up school-based IT in education development plans by the Education Bureau. The importance of a school-based IT plan was reiterated in The Secondary Education Curriculum Guide Booklet 6D (Education Bureau, 2018) after the fourth strategy. Effective school-based IT in the education development plan is expected to integrate IT into learning and teaching across the curriculum, aligned with the school's needs and priorities, and to deploy resources strategically. Developing a good plan involves two main tasks for schools: conducting comprehensive self-review and working collaboratively with stakeholders.

### **Issues in digital learning**

Hong Kong, like many countries with mature development in DL, faces several challenges in K-12 education. These challenges include ethical and healthy use of digital technology, adverse effects of digitalization, challenges in assessments for DL, the widening digital divide, and a lack of long-term plan-

ning by the government.

### ***Ethical and healthy use of digital technology***

Ethical and healthy use of digital technology is a critical aspect of K-12 education in Hong Kong. UNESCO (2016) stresses the importance of the ethical aspect of digital technology use, and Reichert et al. (2020) advocated for enhancing awareness and understanding of digital citizenship among Hong Kong K-12 students. Despite official documents advocating for promoting the ethical aspect of digital citizenship since 2001 (Curriculum Development Council, 2001), no concrete plans or systematic implementation on this issue could be found among K-12 schools in Hong Kong.

To address this issue, cyber ethics were included in the third and fourth strategies (Education Bureau, 2008; 2015) as the target to empower school leaders, teachers, IT in education support staff, students, and parents in the actual use of IT in education, especially in out-of-school use. However, students still face uncertainties, dilemmas, and temptations in their DL experience. Effective communication between various parties is essential to ensure the ethical use of DL.

Unauthorized use of personal information by others and computer viruses are common problems faced by technology users, including K-12 students. In interacting with others online, students may engage in risky online communications, such as looking for new friends on the internet, making acquaintances with someone they have never met face-to-face, or sending personal information. Cyberbullying, although not a major issue, is also worthy of attention, given its potentially serious consequences for students (López-Meneses et al., 2020; Yang et al., 2018).

Digital literacy plays a protective role for students against adverse influences (Weinstein & James, 2022). Learners with higher levels of digital literacy are less likely to suffer from internet and game addiction and are less likely to be

involved in digital security problems, risky online communication, cyberbullying perpetration and victimization. This means that students with higher digital literacy have higher levels of self-protection from adversities. With the increasing risk of online security problems, cyberbullying, and internet addiction, the Hong Kong government updated the “Information Literacy for Hong Kong Students” Learning Framework in 2018 (Education Bureau, 2022b) to include more guidelines on these dimensions.

### *Adverse effects of digitalization*

The adverse effects of digitalization on K-12 education in Hong Kong are a growing concern. Improper use of digital technology has been found to cause mental health problems, internet addiction, game addiction, inadequate sleep, and inadequate physical activity, which have been exacerbated by the COVID-19 pandemic (Alotaibi et al., 2020; Tahir et al., 2021). Increasing cases of internet addiction have been found among K-12 students in Hong Kong, similar to other parts of the world (Sung & Chiu, 2022; Wong et al., 2023). The Hong Kong Federation of Youth Groups (2020) found that e-learning had negative effects on the physical health of students, overuse of electronic devices, and lower learning effectiveness and motivation.

In a recent study on the digital citizenship of K-12 students in Hong Kong, Law et al. (2022) identified schoolwork, leisure, and social networking as the major online activities both at school and at home. The study also identified five specific uses of digital devices during the day, including communicating with family and/or friends, leisure activities at school, schoolwork at school, leisure at home, and schoolwork at home. These trends align with the educational value of online activities, in contrast to the adverse effects identified in other locations (see Daoud et al., 2021). This finding emphasizes that while there may be potential health hazards associated with DL, the healthy and proper use of digital technology for learning should be acknowledged and promoted.

## ***Challenges in assessments for DL***

Assessing students' digital learning skills remains a challenge not only in Hong Kong but globally. The Hong Kong government has proposed formative assessments such as classroom observations, homework, and project assignments (Curriculum Development Council, 2000; Education Bureau, 2014; Pan et al., 2022). However, no systematic guidelines or evaluation criteria have been offered.

The COVID-19 pandemic and online teaching have accelerated the need for transformation in L2 assessment (Chen, 2022). Teachers play an important role in technology-mediated remote assessment (Chen, 2022). Pan et al. (2022) reported the preliminary results of a large-scale digital literacy performance onsite assessment in Hong Kong in online-supported and online self-directed modes during the COVID-19 pandemic. The challenges they identified included tighter school schedules due to the need to carry out assessments, schools' willingness to provide support, equipment and connectivity issues, and the provision of different testing modes. An important issue highlighted by Pan et al. (2022) is cheating in high-stakes tests. They noted that online proctoring or other high-technological solutions to prevent cheating may not be feasible in K-12 schools due to insufficient bandwidth and lack of infrastructure.

Despite the government's endorsement of and encouragement to use e-assessment in the Hong Kong K-12 sector, Pan et al. (2022) raised the issue of inequity in remote assessments, which discriminate against students from low-income families who are less resourceful in terms of technological equipment.

## ***Widening digital divide***

The COVID-19 pandemic has highlighted and exacerbated the digital divide among Hong Kong K-12 students. The digital divide can exist not only among individuals but also among households, businesses, and geographical areas, according to the OECD (2001). Among Hong Kong K-12 students, lack of ac-

cess to technology and digitally illiterate parents are two aspects of the digital divide commonly identified (Chun et al., 2023). Students and schools that participated in the research conducted by the Hong Kong Federation of Youth Groups (2020) also shared the view that e-learning would widen the gap between students from rich and poor families.

In 2021, only 75.2% of poor families (i.e., those with monthly household income below HK\$10,000) had access to the internet, which is relatively low compared to over 90% of other income groups (Census and Statistics Department, 2022a). In 2019, the same percentage was only 71%, which again was relatively low compared to over 90% of other income groups (Census and Statistics Department, 2020). Differences in ICT use patterns were also found between K-12 students of lower and higher-income families in Hong Kong, with students of lower-income families spending more time using a computer at home, and students of higher-income families having more access to ICT (Yuen et al., 2014).

To address the widening digital divide, the Education Bureau has implemented the “Computer Recycling Scheme” and the five-year “i Learn at home” program since 2011 (Yuen et al., 2014). However, despite the government’s efforts in terms of resource support (mainly financial) and initiatives (such as computer recycling), students from low-income groups still suffer from basic problems, including the inability to own a computer and lack of internet access (Chun et al., 2023). In a review of digital citizenship development in Hong Kong conducted by Reichert et al. (2020), it was identified that 30% of the participating students studying Primary 3, Secondary 1, and Secondary 3 had no access to desktops, notebook computers, or tablets. Chun et al. (2023) noted that the effectiveness of the e-learning implementation emphasizing “Bring your Own Device” remained doubtful, given the significant percentage of K-12 students who do not have access to proper devices.

It has been almost a decade since the Hong Kong government implemented its

last strategy on Information Technology in Education, and it is high time for a new policy to be in place for the future implementation of new initiatives on IT in education in Hong Kong.

### ***Lack of long-term planning by the government***

Hong Kong has reached a mature stage of digitalization with sophisticated adoption in education. However, there is a need for more systematic review, future planning, and incorporation of new initiatives identified from advanced locations. While policies to promote digital citizenship are suggested in reports in a piecemeal manner, digital citizenship has never been included in the strategic plans of the government or its implementation. Macro planning and policy on digital citizenship should take into consideration a myriad of factors, including student needs (on both learning and leisure), family environment, devices available, and types of guidance (e.g., ethical use of the internet) to be given to students.

Two other relevant issues are the lack of software support and the uneven development of DL among school sectors. The curricula at all levels of education in Hong Kong are unique due to contextual influence, and at the same time, Hong Kong is a small market. Much overseas-developed software for digital learning may not be applicable in Hong Kong, and investors are unwilling to invest in the small market due to uncertainties of economic return. Due to reasons such as the nature of the curriculum, the learning needs of students caused by characteristics such as age, teacher attitude and knowledge, and school support, the speed and coverage of digitalization in Hong Kong are expected to be uneven.

In the surveys reported in the *Consultation Document on the Third Strategy on Information Technology in Education*, stakeholders suggested that a clear strategy in the school development plan, together with support from school leaders, is required for the successful integration of IT into learning and teach-



ing (Education Bureau, 2007). This means that DL is subject to school leadership, and there may be uneven development among schools in terms of DL development.

Government efforts to promote digital learning should be accompanied by a long-term plan that considers the unique needs of Hong Kong's education system and the resources required to achieve these goals.

## Conclusion

This chapter provides an overview of the Hong Kong K-12 schooling system, and highlights the advanced stage of Digital Transformation in which innovative and disruptive education transformation is being implemented. However, evidence suggests that pre-school and kindergarten education in Hong Kong is not as developed compared to primary and secondary schools in this third stage of Digital Transformation. This chapter argues that the Hong Kong government can make more strategic decisions for innovative and disruptive education transformation, given that many of these innovations are initiated by individual teachers, schools and academics.

Hong Kong has always been at the forefront of DL infrastructure, and the four strategies on information technology demonstrate the government's commitment to the development of DL for K-12 students. Generous financial and consultative support has been provided by the government, coupled with ongoing teacher professional development on the latest developments in DL. This chapter identifies the features of DL, including a high degree of digital competence increasing at a rapid pace, nurturing higher-order thinking skills, and encouraging parental involvement.

This chapter suggests several trends in DL for K-12 students, including more sophisticated and diverse use of digital learning, promotion of autonomous

and personalized DL, ongoing development of initiatives on DL in individual schools, more intensive teacher training, and ongoing curriculum transformation. However, the chapter also raises five issues in K-12 education in Hong Kong in terms of DL, including ethical and healthy use of digital technology, adverse effects of digitalization, challenges in assessments in DL, the widening digital divide, and a lack of long-term planning by the government.

Despite these challenges, the historical development of DL in Hong Kong K-12 schools, including its planning and implementation, the response of Hong Kong K-12 schools to the COVID-19 pandemic in terms of DL, their DL infrastructure, and the features, trends and issues in DL, consistently indicate the uniqueness of the DL of Hong Kong K-12 schools. The first uniqueness is a well-established infrastructure, especially in terms of WiFi networks. The second is the government's responsiveness to the rapidly changing DL landscape, which is reflected by the variety of themes of the four strategies on DL promulgated to date. The third uniqueness is the high levels of digital literacy and competence of students, which are supported and facilitated by the prevalence of communication technology in the Hong Kong community at large.

K-12 teachers in Hong Kong welcome and are enthusiastic about adopting DL, which is reflected by the widespread implementation and the ongoing emergence of innovative pedagogy. However, as with students in many technology-savvy cities, K-12 students in Hong Kong are exposed to risks of physical and mental health hazards caused by technology addiction, privacy infringement, financial losses, and criminal commitments caused by unethical use of technology.

This chapter concludes that Hong Kong should continue to strive for a balanced and sustainable approach to DL, addressing the challenges and leveraging the opportunities presented by the digital world to provide high-quality education for all.

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