



Faculty of **Education**  
The University of Hong Kong



**Creating a Barrier-Free Online Learning Environment for Primary School Students  
with Special Educational Needs in Hong Kong**

**Final Report**

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**Prepared by the Speech, Language and Reading Lab, Unit of Human Communication,  
Development, and Information Sciences, Faculty of Education**

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## Executive Summary

1. With the funding support from the Equal Opportunities Commission, The Speech, Language and Reading Lab of the University of Hong Kong conducted a study titled “Creating a Barrier-free Online Learning Environment for primary school students with Special educational needs (SEN) in Hong Kong”. The study objectives were to:
  - Examine the difference in the effectiveness of online learning between primary school students with SEN and their age-matched typically developing peers;
  - Identify the difficulties and psychological impacts faced by teachers and parents in assisting students with SEN with online learning;
  - Identify the challenges and the psychological impacts that students with SEN experienced in online learning and the variations among SEN subtypes; and
  - Evaluate the effectiveness and feasibility of online learning content and online learning tasks for students with SEN with reference to the SEN subtypes.
2. To achieve these objectives, we adopted quantitative and qualitative methodological approaches to collect data through a questionnaire study and semi-structured in-depth interviews with local teachers, students and caregivers. A total of 932 participants including 506 caregivers, 254 students and 101 teachers took part in the questionnaire study while 25 pairs of caregivers and students and 21 teachers participated in the semi-structured in-depth interview study. Our participant consisted of students with different SEN who exhibited different levels of challenges during online learning.
3. Overall, students with SEN demonstrated lower online learning attitudes and online learning effectiveness as rated by students, teachers and caregivers. Furthermore, our study also found students with SEN exhibited difficulties in aptitude, online learning performance, interaction and learning transfer.
4. Relative to typically developing students, six major barriers in online learning for students with SEN identified in the current study include (1) inadequate and difficulties for school to provide school support; (2) lower self-discipline in learning; (3) more easily being distracted during online lessons; (4) lower willingness to learn; (5) more restricted interaction with teachers and classmates; and (6) difficulties in maintaining the knowledge learnt. Nevertheless, three major facilitators were also identified in online learning for the student with SEN. They were (1) sophisticated use of technology, (2) higher engagement by the feedback from the interface, and (3) exploration of their interesting topic online. Failure to address the major barriers may affect the long-term learning outcome of the students with SEN and result in a negative learning experience. Thus, different stakeholders should work together to mitigate these barriers and to promote a socially inclusive online learning environment.
5. To promote a socially inclusive online learning environment for students with SEN, it is important that the government, schools, teachers and caregivers work together to

strategically (1) develop an online game-like platform for learning different subjects; (2) establish a unified learning platform and online learning support system; (3) organize sharing workshops on successful online teaching experience at the across-school level and within-school level; (4) encourage teachers to attend SEN-related profession development; (5) provide additional learning support service to students with SEN, and (6) foster effective communication between teachers and caregivers.

## 行政摘要

1. 平等機會委員會資助香港大學言語、語言和閱讀實驗室進行一項題為《為香港有特殊教育需要的小學生營造無障礙網上學習環境研究》。研究目標包括：
  - 探討有特殊教育需要的小學生與其同齡學生在網上學習的效果差異；
  - 調查教師和家長在協助有特殊教育需要的學生進行網上學習時所面臨的心理影響和困難；
  - 調查有特殊教育需要的學生在網上學習中遇到的心理影響和挑戰及不同類別特殊教育需要學生的差異；和
  - 根據不同類別特殊教育需要學生，評估不同網上學習內容和支援措施的有效性和可行性。
2. 就以上研究目標，我們採用量性和質性方法邀請教師、學生和家長參與問卷調查和半結構式訪談。932位參與者，包括506名家長、254名學生和101名教師參與了問卷調查，以及25對家長和學生及21名教師參加了半結構式訪談。參與學生包括不同類別特殊教育需要，於網上學習時面對不同程度的挑戰。
3. 整體而言，根據學生、教師和家長的評價，有特殊教育需要的學生的網上學習態度和網上學習成效較低。研究亦同時發現，有特殊教育需要的學生在個人能力、網上學習表現、互動和鞏固學習成果方面存在困難。
4. 相對一般學生，本研究發現有特殊教育需要的學生於網上學習的六項主要障礙為：(1) 學校難以提供支援措施、(2) 學習自律性較低、(3) 網上上課時容易分心、(4) 學習動機較低、(5) 與老師和同學的互動更為有限，以及(6) 難以鞏固所學知識。然而，他們的網上學習有三個促進因素，包括(1) 熟悉使用電子設備、(2) 網上界面的多元化反饋，以及(3) 在網上探索感興趣的課題。若不處理這些障礙可能會影響有特殊教育需要的學生的長遠學習成果，並導致負面的學習體驗。因此，不同的持份者應共同努力以消除這些障礙並構建一個共融的網上學習環境。
5. 為了營造共融的網上學習環境予有特殊教育需要的學生，政府、學校、教師和家長應採取以下幾種方案：(1) 開發具網絡遊戲形式的跨學科學習平台、(2) 建立單一學習平台及網上學習支援系統、(3) 舉辦跨校和校內網上教學經驗工作坊的分享成功經驗、(4) 鼓勵教師參加與特殊教育需要相關的專業發展、(5) 為有特殊教育需要的學生提供額外的學習支援服務，以及(6) 促進教師與家長之間的溝通。



## Chapter 1 Background

- 1.1. This chapter outlines the online learning policy and equal learning opportunities for students with special educational needs (SEN) in Hong Kong and presents background information on possible difficulties faced by students with SEN along with rationales and objectives of the present study.

### Background

#### Equal Learning Opportunities for Students with SEN

- 1.2. The Disability Discrimination Ordinance (DDO) was implemented in 1996 to provide legal requirements and guidance under the DDO to ensure that equal learning opportunities are given to students with disabilities.
- 1.3. The Code of Practice on Education was introduced by the Equal Opportunities Commission (EOC) in accordance with the DDO to provide practical guidelines to educational institutions and educators to meet the requirements of the DDO. Specifically, the Code of Practice on Education stresses that “Educational establishments should actively observe whether students with disabilities have difficulty in following the curriculum because of their disabilities. A tailored curriculum should enable students with disabilities to achieve the objective of the curriculum more easily without necessarily lowering its standard.” (Legislative Council, 2015, p.14). Therefore, as online learning becomes more common, specially so during the COVID-19 pandemic, schools and caregivers need to work together to ensure that the online learning platform is a barrier-free environment for children with SEN.

#### Online learning in Hong Kong

- 1.4. The Fourth Strategy on IT in Education (ITE4) was launched in 2015 by the Education Bureau. There are six supporting actions, with three of them relevant to the current study, including “enhancing the quality of e-learning resources”, “renewing curriculum, transforming pedagogical and assessment practices”, and “involving parents, stakeholders and the community”. ITE4 stresses the importance of curriculum renewal to meet the diversity of students, including students with SEN. To provide a platform for common resources among teachers and the community, Hong Kong Education City Limited (HKECL) created a webpage specifically for SEN. However, most of the resources in this section provided strategies for classroom learning. There were only four teaching videos on science, technology, engineering, and mathematics (STEM) and interactive teaching and no resource under online learning modifications. Thus, teachers may face difficulties in providing support to students with SEN and offering advice to parents on the use of online learning.
- 1.5. In addition, parents play an important role in online learning. Under the ITE4 report, parents are encouraged to participate actively to promote e-learning at home and be aware of the potential danger of cybersecurity and health issues. In this way, parents can engage in their children’s learning and assist them whenever needed.

### Online Learning during COVID-19

- 1.6. Much research on the COVID-19 pandemic has highlighted the potential impact to students due to school closure. Due to various degrees of lockdown and social distancing measures, academic learning has been shifted to online classes around the world. However, the effectiveness of online learning remains unclear.
- 1.7. Providing live teaching through an online platform is a completely novel idea for teachers. As pointed out by Wang et al. (2020), currently no available and concrete guidelines are provided for teachers to conduct online teaching. Teachers could have different understanding of the methods and contents of online teaching as well as the workload for students, which may result in a lack of meticulous and consistent planning regarding online teaching and learning. Furthermore, teachers could also encounter challenges related to effective classroom management online. In cases where students could not or did not want to participate, teachers often found themselves more powerless in online classes as compared to face-to-face teaching (Ning & Corcoran, 2020) because concentration during online learning and resistance from the distractions at home are difficult for primary school students (Lau & Lee, 2020). In addition, teachers had to cope with the extra workload arising from the lower quality of students' work compared to classroom homework (Cullinane & Montacute, 2020).
- 1.8. Parents and students face significant challenges and pressure in online learning. One of the main issues is the accessibility to networks and devices, especially for low-income families. Goldschmidt (2020) found that because not all members of a family own an electronic device, accessibility to the internet for low-income families was low, which may affect their attendance to online classes. Moreover, living space could be limited, and children could be easily distracted by their surroundings, which may result in a lack of concentration on their academic learning (Wang et al., 2020). Meanwhile, for younger children, assistance from parents is necessary during online learning to resolve possible technical problems and follow the class schedule (Masters, Taylor-Guy, Fraillon & Chase, 2020). This adds to the pressure of parents as they have to balance work, housework and their children's needs in online learning. Additionally, as the wide range of tools adopted by the school, the acquisition of the use of online learning tools may be difficult for students and their caregivers, (Jasen et al., 2017; Lau & Lee, 2020). Parents may face additional workload compared to typical learning at school since the school and teachers are mainly responsible for the students' learning preparation and process.

### Difficulties Faced by Students with Special Educational Needs in Online Learning

- 1.9. The challenges faced by students with SEN during online learning are even more as compared to their typically developing peers. For example, research has shown that due to the lack of physical activities and training, online learning environments were often not suitable for children with autism spectrum disorder (ASD) (Yarımkaya & Esentürk, 2020). Moreover, students with ASD or attention-deficit hyperactivity disorder (ADHD) were found to have difficulty with their concentration during online learning (Sam, Kucharczyk & Water, 2017). In addition, students with specific learning disabilities

(SpLD) and speech and language impairment (SLI) may find it difficult to comprehend online learning materials without additional support from teachers (Smith & Basham, 2014). As special education support has been suspended during the pandemic, extra learning support should be given to students with SEN for helping them achieve the same learning goals as their typically developing peers.

- 1.10. Teachers and parents also need to pay extra effort in assisting students with SEN in online learning. Given that online learning emphasizes independent and individualized learning goals, the online learning platform needs to be adjusted and modified to meet the needs of students with non-sensory learning disabilities (Smith & Basham, 2014). For example, teachers and parents have to modify the use of learning assisting tools (e.g., visual support, monitoring strategies, and self-management) to an online version (Sam, Kucharczyk & Water, 2017). However, the effectiveness of these online tools needs to be tested individually and repeatedly. Furthermore, parents have to take up a more proactive role in online learning. However, with only the online learning materials, parents may find it difficult to follow and may require extra support from teachers (Yarımkaaya & Esentürk, 2020).

### **Study Objectives**

- 1.11. To address this urgent educational issue concerning online learning for students with SEN, this study was designed to (1) examine the difference in the effectiveness of online learning between primary school students with SEN and their age-matched typically developing peers; (2) identify the difficulties and psychological impacts faced by teachers and parents in assisting students with SEN with online learning; (3) identify the challenges and the psychological impacts that students with SEN experienced in online learning and the variations among SEN subtypes; and (4) evaluate the effectiveness and feasibility of online learning content and online learning tasks for students with SEN with reference to the SEN subtypes.
- 1.12. In addition to this Chapter 1 on Background of this study, there are other four chapters as follows: Chapter 2 describes the methodological approaches taken in this study. Chapter 3 summarizes key findings from both quantitative and qualitative studies. Chapter 4 outlines the challenges and needs of online learning faced by primary school students with SEN in Hong Kong. Chapter 5 provides evidence-based recommendations and suggestions on how to promote a socially inclusive and suitable online learning environment in Hong Kong.

## Chapter 2 Methodology

- 2.1. To achieve our research objectives, we implemented an integrated quantitative-qualitative approach to comprehensively understand the challenges and difficulties faced by students with SEN, their caregivers, and school teachers. We adopted the form of large-scale surveys and in-depth interviews which were described in detail below. .

### The Quantitative Study

- 2.2. A questionnaire was developed with input from the literature and news report review, team members' experience on providing online teaching and learning in Hong Kong. A review panel, which consisted of four educational researchers and three experienced primary school teachers, reviewed the questionnaire to ensure the content and wordings of the questionnaire were appropriate for evaluating online learning experiences in primary school students.
- 2.3. The quantitative research examined the effectiveness of online learning, its difficulties and psychological impact, and ways to support from the perspectives of students, caregivers and teachers.
- 2.4. For the caregivers' and students' surveys, the questionnaire comprised three sections, namely (1) students' online learning attitude, (2) students' online learning effectiveness and (3) ways to improve online learning. Students' online learning attitude questionnaire consisted of 34 items in five subscales, including 1) enjoyment, 2) development, 3) motivation, 4) utilization and 5) affection. Students' online learning effectiveness consisted of 67 items in 13 subscales which were 1) learning goals, 2) prerequisites, 3) environmental structuring, 4) learning environment, 5) time management, 6) engagement in learning activities, 7) persistence, 8) interaction between teachers and students, 9) interaction among students, 10) feedback from the Interface; 11) maintenance of skills and knowledge, 12) application of skills and knowledge, and 13) meaning of learning. Ways to improve online learning consisted of 16 methods for caregivers and students to evaluate. Appendix 1 presents the questionnaire for caregivers and students.
- 2.5. For the teachers' survey, the questionnaire was classified into three sections including (1) students' online learning attitude, (2) students' online learning effectiveness and (3) ways to improve online learning. Students' online learning attitude consisted of 12 items in five subscales, including enjoyment, development, motivation, utilization and affection. Students' online learning effectiveness consisted of 18 items in ten subscales, including 1) learning goals, 2) environmental structuring, 3) learning environment, 4) time management, 5) engagement in learning activities, 6) the interaction between teachers and students, 7) interaction among students, 8) feedback from the interface, 9) application of skills and knowledge, and 10) meaning of learning. For these two sections, teachers were asked to rate the items separately for typically developing students, students with ADHD, students with ASD, students with SpLD, and students with SLI. Ways to improve

online learning consist of 16 methods for teachers to evaluate on usefulness and feasibility. Questionnaire for teachers can be found in Appendix 2.

- 2.6. The recruitment method was by the promotion of our Speech, Language and Reading (SLR) laboratory's Facebook page (<https://www.facebook.com/HKU.SLRLab/>). Data collection was conducted through an online portal, Qualtrics. Participants completed the online consent form before completing the questionnaire. A total of 506 caregivers, 254 students, and 101 teachers participated in the quantitative study. The data collection was done from mid-December 2020 to mid-March 2021.

### **The Qualitative Study**

- 2.7. As in developing the questionnaire survey, the same evidence-based approach was applied to develop a set of interview questions which were based on input from the literature, preliminary results from the quantitative study, news report review, and team members' experience in providing online teaching and learning in Hong Kong. A review panel, which consisted of four educational researchers and three experienced primary school teachers, reviewed the interview guide to ensure the content and wordings of the questions were appropriate for evaluating online learning experiences in primary school students.
- 2.8. The qualitative research explored the possible interaction of multiple factors, i.e., aptitude, personal factor, environmental factor and academic output in online learning. The interviews focus on the experiences various stakeholders faced during online learning, the feelings and reasoning towards the experiences, the impact on their attitude towards online learning based on various types of SEN.
- 2.9. For the interview questions, the questionnaire was divided into four sections, namely (1) students' online learning aptitude, (2) students' personal factor, (3) online learning environment and (4) academic output. A total of 18 question prompts for interviewees were presented in Appendix 3.
- 2.10. The interview study comprised 25 pairs of caregivers and students with SEN, and 21 teachers, all recruited from the participants in the questionnaire survey study. All participants of the survey study were asked to express their interest in taking part of the related interview study at the end of the questionnaire. The final participants for the interview study were selected based on their availability. The interviews were conducted after obtaining the interviewee's written consent. It was started with a brief introduction of the study, followed by session of obtaining signed the consent form and explaining participants about the rights, confidentiality of identity and data collected, and compensation. Audio-recording was conducted during the interview, which was transcribed into texts for analysis by two trained student research assistants. Participants were then given the opportunity to review and revise the transcript. The caregivers, students and teachers individually completed the interview in approximately 30 minutes.

No difficulties were observed or encountered when collecting views from the participants. The data collection was conducted from July to August 2021.

### **Data Analysis**

- 2.11. For the survey study (online learning attitude and effectiveness), descriptive analysis was conducted to compare typically developing children and children with SEN from the caregivers', students' and teachers' perspectives. The means and standard deviations of online learning attitudes and effectiveness between typically developing students and students with SEN from the perspectives of caregivers, students and teachers were computed. Mean can be referred as the average performance of the group and standard deviation can be referred as the dispersion of the group performance.
- 2.12. Afterwards, *t*-tests was conducted to compare the group difference on online learning attitude and effectiveness. *T*-tests are used to examine whether there are significant difference on mean between groups.
- 2.13. Regarding the interview study, thematic analysis was adopted with a pre-designated set of codes (based on the literature review and questionnaire study). The research team and undergraduate research assistants first transcribed the interview scripts. The interviewees had the opportunity to review the transcript and make necessary changes. Afterwards, the research team and undergraduate research assistants coded the transcript based on the codes.

## Chapter 3 Key Findings

- 3.1. This chapter describes the characteristics of study participants in both quantitative and qualitative studies. A total of 506 caregivers, 254 students and 101 teachers participated in the quantitative study. Furthermore, 21 teachers and 25 caregiver-student pairs participated in the qualitative study.
- 3.2. In addition, this chapter presents the findings of the quantitative and qualitative studies. Regarding the quantitative study, a comparison between typically developing students and students with SEN and a comparison between various SEN types were presented from the students', caregivers' and teachers' perspectives to address the first research objective. Regarding the qualitative study, emergent themes were presented in response to the second and third research objectives. Students with SEN faced difficulties during online learning, from personal factors to environmental factors, which affected their learning outcomes. The emergent themes were distilled into four major categories (1) aptitude, (2) personal difficulties, (3) environmental difficulties, and (4) academic outcome. To support the theme, illustrative quotes from the participants are included.

### Findings from Surveys

- 3.3. A total of 506 caregivers, 254 students, and 101 teachers participated in the quantitative study. In the caregivers' sample, 179 of the caregivers (35.4%) had typically developing children, while 327 of the caregivers (64.6%) had a child with SENs. Most of the caregivers who responded to the survey were the mother of the child (91.1%). In the students' sample, 96 of them (37.8%) were typically developing, while 158 of them had SENs (62.2%). All the children of the caregivers and students who responded reported using online learning before. Table 3.1 presents the socio-demographic details of the caregiver and student participants. In the teachers' sample, the average year of online teaching experience was 9.4 ( $SD = 6.2$ ), and 48 of them (47.5%) received professional training on SEN by the Education Bureau. Eighteen of them (17.8%) held SEN-related positions and all of them had experience in teaching students with SEN and online teaching experience. Table 3.2 presented the demographic details of the teacher participants.

Table 3.1. *Socio-Demographic profile of the caregivers and students in the questionnaire study.*

Variable	Caregiver sample ( $n = 506$ )	Student sample ( $n = 254$ )
Grade of the student		
Grade 1	77 (15.2%)	33 (13.0%)
Grade 2	74 (14.6%)	29 (11.4%)
Grade 3	93 (18.4%)	46 (18.1%)
Grade 4	79 (15.6%)	44 (17.3%)
Grade 5	102 (20.2%)	61 (24.0%)
Grade 6	81 (16.0%)	41 (16.1%)
Sex of the student		

Male	314 (62.1%)	152 (59.8%)
Female	192 (37.9%)	102 (40.2%)
Relationship with the student <sup>a</sup>		
Mother	461 (91.1%)	
Father	37 (7.3%)	
Others	8 (1.6%)	
Typical developing students	179 (35.4%)	96 (37.8%)
Special educational needs of the student <sup>b</sup>		
Specific Learning Difficulties	139 (27.5%)	57 (22.4%)
Autism Spectrum Disorders	110 (21.7%)	62 (24.4%)
Attention Deficit/ Hyperactivity Disorder	177 (35.0%)	81 (31.9%)
Speech and Language Impairment	102 (20.2%)	61 (24.0%)
Online learning method(s) used <sup>b</sup>		
E-mail	179 (35.4%)	105 (41.3%)
Online learning materials	391 (77.3%)	186 (73.2%)
Learning management system	360 (71.1%)	181 (71.3%)
Learning video	343 (67.8%)	159 (62.6%)
Online assessment	228 (45.1%)	120 (47.2%)
Real-time online teaching	461 (91.1%)	231 (90.9%)

Notes: <sup>a</sup>This question was included in the caregivers' questionnaire only.

<sup>b</sup>Can choose more than one option.

Table 3.2. *Socio-Demographic profile of the teachers in the questionnaire study (n = 101).*

Variable	Number of teachers
Position	
Teacher	78 (77.2%)
SEN support teacher	6 (5.9%)
SEN coordinator	12 (11.9%)
Curriculum leaders	5 (5.0%)
Grade(s) taught <sup>a</sup>	
Grade 1	45 (44.6%)
Grade 2	45 (44.6%)
Grade 3	56 (55.4%)
Grade 4	54 (53.5%)
Grade 5	50 (49.5%)
Grade 6	34 (33.7%)
Professional development related to special educational needs <sup>a</sup>	
Basic course	48 (47.5%)
Advanced course	30 (29.7%)
Thematic course	19 (18.8%)
Subject(s) taught <sup>a</sup>	
Chinese Language	34 (33.7%)



English Language	31 (30.7%)
Mathematics	40 (39.6%)
General Studies	63 (62.4%)
Music	28 (27.7%)
Visual Arts	22 (21.8%)
Physical Education	6 (5.9%)
Putonghua	13 (12.9%)
Sex of the teacher	
Male	16 (15.8%)
Female	85 (84.2%)
Special Educational Needs of the student <sup>a</sup>	
Specific Learning Difficulties	93 (92.1%)
Autism Spectrum Disorders	97 (96.0%)
Attention Deficit/ Hyperactivity Disorder	96 (95.0%)
Speech and Language Impairment	82 (81.2%)
Online learning method(s) used <sup>a</sup>	
E-mail	83 (82.2%)
Online learning materials	99 (98.0%)
Learning management system	99 (98.0%)
Learning video	95 (94.1%)
Online assessment	94 (93.1%)
Real-time online teaching	99 (98.0%)

*Note:* <sup>a</sup>Can choose more than one option.

### Online Learning Attitude between Typically Developing Students and Students with SEN

3.4. Regarding online learning attitude, five domains covered in the questionnaire were (1) enjoyment, (2) utilization, (3) development, (4) affection and (5) motivation. Enjoyment focused on the positive feelings of students during online learning. Utilization stresses the cognitive belief that students believe the knowledge learnt can be used, while development emphasizes the cognitive belief that the knowledge learnt is beneficial to students personally and academically. Affection focuses on the negative emotions of students during online learning. Motivation refers to the behavioural intention of students during online learning. Score of the domains is the total score of all items under the domain.

3.5. First, analysis was conducted to compare typically developing children and children with SEN from the caregivers', students' and teachers' perspectives. Table 3.3 – Table 3.5 report the means (Ms) and standard deviations (SDs) of online learning attitudes between typically developing students and students with SEN from the perspectives of caregivers, students and teachers. From the caregivers' perspective, students with SEN reported significantly less enjoyment (difference = 1.41), utilization (difference = 1.88) and motivation (difference = 1.30); and significantly higher affection (difference = 2.42) than typically developing students during online learning. However, no significant difference was found in development between typically developing students and students with SEN.

From the students' perspective, students with SEN had significantly higher affection (difference = 1.69) than typically developing students. However, no significant difference in enjoyment, utilization, development and motivation between typically developing students and students with SEN. This showed caregivers perceived students with SEN having significantly lower online learning attitudes compared to typically developing students. However, students with SEN only reported they had more negative emotions (i.e., affection) compared to typically developing students but not for any other aspects of attitude.

- 3.6. Next, the difference in online learning attitudes was evaluated between various SEN subtypes. From the caregivers' perspective, with reference to the *t*-tests, no significant difference was noted between students with ADHD, ASD, SpLD and SLI in all five aspects of online learning attitude. In addition, from the students' perspective, with reference to the *t*-tests, no significant difference was noted between students with ADHD, ASD, SpLD and SLI in all five aspects of online learning attitude. However, from the teachers' perspective, with reference to the *t*-tests, students with ASD had significantly higher affection (i.e., negative emotions; 7.21 out of 10) than students with other types of SEN (ranged from 6.61 to 6.81). For other aspects of online learning attitude, no significant difference was reported between students with ADHD, ASD, SpLD and SLI.

#### *Online learning effectiveness between typically developing students and students with SEN*

- 3.7. Online learning effectiveness comprised three stages of the process, namely the preparation phase, performance phase and transfer phase. The preparation phase refers to the work that is required to begin learning. The performance phase is referred to the students' performance during the learning activities, while the transfer phase focuses on both the short-term and long-term gain after online learning.

Table 3.3. *Online learning attitude between typically developing (TD) students and students with SEN from the perspectives of caregivers (n = 506)*

Variable (max. score of the variable)	TD Students		Students with SEN <sup>a</sup>		Significant difference between TD and SEN	Students with ADHD		Students with ASD		Students with SpLD		Students with SLI	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
	(n = 179)		(n = 327)			(n = 177)		(n = 110)		(n = 139)		(n = 102)	
Enjoyment (40)	26.77	7.16	25.36	7.46	*	25.06	7.81	25.72	7.99	25.47	7.71	25.69	7.52
Utilization (25)	19.12	5.62	17.24	6.16	***	17.34	6.26	17.95	6.57	16.78	6.39	17.28	6.52
Development (40)	21.41	6.86	20.21	7.03	n.s.	20.17	7.26	20.45	6.96	20.09	7.22	20.10	6.74
Affection (30)	21.83	5.17	24.25	5.22	***	24.19	5.34	24.22	5.07	24.99	5.20	23.78	5.31
Motivation (35)	18.71	5.72	17.41	6.06	*	17.58	6.34	17.75	6.38	17.45	5.79	17.58	5.57

*Note:* <sup>a</sup>Students can report more than one type of SEN. Thus the number of students with SEN is not equal to the sum of students with ADHD, ASD, SpLD, and SLI. Significance levels were compared between TD students and students with SEN, n.s. = no significant difference, \* = two groups were significantly different at 5% level of significance, \*\*\* = two groups were significantly different at 0.1% level of significance.

Table 3.4. *Online learning attitude between TD students and students with SEN from the perspectives of students (n = 254)*

Variable (max. score of the variable)	TD Students		Students with SEN <sup>a</sup>		Significant difference between TD and SEN	Students with ADHD		Students with ASD		Students with SpLD		Students with SLI	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
	(n = 96)		(n = 158)			(n = 81)		(n = 62)		(n = 57)		(n = 61)	
Enjoyment (40)	25.98	7.37	25.68	7.75	n.s.	26.35	7.63	26.13	8.39	26.00	7.16	24.52	8.81
Utilization (25)	22.07	6.02	20.56	6.42	n.s.	21.01	6.76	20.61	6.96	20.89	6.34	19.00	7.38

Development (40)	24.61	6.47	23.07	7.42	n.s.	23.52	7.61	23.63	7.74	23.21	7.68	21.74	8.08
Affection (30)	21.79	5.42	23.48	5.36	***	23.38	5.50	23.33	5.36	24.28	5.25	24.25	5.09
Motivation (35)	20.99	6.18	19.83	6.90	n.s.	20.30	6.70	20.29	7.38	19.46	6.71	18.69	7.35

*Note:* <sup>a</sup>Students can report more than one type of SEN. Thus the sum of students with SEN is not equal to the sum of students with ADHD, ASD, SpLD, and SLI. Significance levels were compared between TD students and students with SEN, n.s. = no significant difference, \*\*\* = two groups were significantly different at 0.1% level of significance.

Table 3.5. *Online learning attitude between TD students and students with SEN from the perspectives of teachers (n = 101)*

Variable (max. score of the variable)	TD Students		Students with ADHD		Students with ASD		Students with SpLD		Students with SLI		Significant difference between TD and SEN
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Enjoyment (15)	11.01	2.03	9.78	2.68	9.44	2.64	9.16	2.74	9.31	2.69	***
Utilization (10)	5.84	1.55	4.50	1.54	4.46	1.57	4.41	1.44	4.52	1.59	***
Development (15)	10.07	1.94	8.86	2.27	8.59	2.44	8.51	2.45	8.61	2.40	***
Affection (10)	5.79	1.75	6.81	1.64	7.21	1.88	6.62	1.58	6.61	1.52	***
Motivation (10)	6.84	1.38	6.15	1.40	6.05	1.40	5.86	1.41	5.97	1.28	***

*Note:* <sup>a</sup>Teachers did not rate students with SEN overall.

Significance levels were compared between TD students and students with SEN, n.s. = no significant difference, \*\*\* = two groups were significantly different at 0.1% level of significance.

- 3.8. Concerning the preparation phase, there were four subscales in the caregiver and student questionnaire including 1) learning goals, 2) prerequisites, 3) environmental structuring and 4) learning environment. Learning goals focused on the understanding of learning objectives and prerequisites stressed on the activation of prior knowledge to archive the learning objectives. Environmental structuring emphasized the appropriateness of the home learning environment for online learning, while the learning environment was referred to as the use of online learning platforms. In the teachers' version, only learning goals, environmental structuring and learning environment were included.
- 3.9. The performance phase consisted of six subscales in the caregiver and student questionnaire, including 1) time management, 2) engagement in learning activities, 3) persistence, 4) the interaction between teachers and students, 5) interaction among students, and 6) feedback from the interface. Time management refers to how students allocate time for online learning while engaging in learning activities focused on the active participation of students during online learning. Persistence was defined as the determination of students to overcome challenges in online learning. Interaction between teachers and students evaluated the help-seeking between teachers and students while interaction among students focused on peer learning and communication during online learning. Feedback from the interface was referred to the feedback and comments given by the online learning platforms to students. In the teachers' version, only time management, engagement in learning activities, the interaction between teachers and students, interaction among students, and feedback from the interface were included.
- 3.10. The transfer phase consisted of three subscales, namely 1) maintenance of skills and knowledge, 2) application of skills and knowledge, and 3) meaning of learning. Maintenance of skill and knowledge stressed on whether students can memorize the knowledge learnt after online learning while application of skills and knowledge focused on whether students can apply them in academic situations and daily life. Meaning of learning was referred to the understanding of learning activities. In the teachers' version, only application of skills and knowledge and meaning of learning were included. Table 3.6 – Table 3.8 showed the means and standard deviations of online learning effectiveness between typically developing students and students with SEN from the perspectives of caregivers, students and teachers.

Table 3.6. *Online learning effectiveness between TD students and students with SEN from the perspectives of caregivers (n = 506)*

Variable (maximum score of the variable)	TD Students		Students with SEN <sup>a</sup>		Significant difference between TD and SEN	Students with ADHD		Students with ASD		Students with SpLD		Students with SLI	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
	<i>(n = 179)</i>		<i>(n = 327)</i>			<i>(n = 177)</i>		<i>(n = 110)</i>		<i>(n = 139)</i>		<i>(n = 102)</i>	
Preparation Phase													
Learning Goals (25)	13.68	4.24	12.30	4.52	***	12.20	4.70	12.60	4.65	12.21	4.74	12.40	4.27
Prerequisites (25)	14.88	4.27	13.77	4.28	**	13.85	4.33	13.43	4.43	13.65	4.52	13.29	4.25
Environmental Structuring (25)	17.27	4.02	16.30	4.08	*	16.12	4.15	16.25	4.40	16.20	3.96	15.84	4.42
Learning Environment (25)	15.56	3.53	14.26	3.94	***	14.37	3.96	13.96	4.37	14.29	4.09	13.90	4.25
Performance Phase													
Time Management (25)	14.95	4.42	13.47	4.61	***	13.26	4.79	13.68	4.95	13.62	4.84	14.09	4.85
Engagement in Learning Activities (25)	14.43	4.58	12.91	4.37	***	12.60	4.33	12.86	4.79	12.86	4.66	12.68	4.34
Persistence (25)	14.60	4.03	12.49	4.26	***	12.24	4.17	12.55	4.62	12.56	4.48	12.31	4.46
Interaction between teachers and students (30)	18.68	5.05	16.65	5.67	***	16.32	6.01	16.88	5.64	16.40	5.95	15.80	5.66
Interaction among students (25)	12.79	4.59	11.74	4.77	*	11.42	4.86	11.35	4.92	12.30	5.11	11.46	4.40
Feedback from the interface (25)	14.02	4.19	12.87	4.54	**	12.69	4.75	12.85	4.62	12.92	4.81	12.75	4.20
Transfer Phase													
Maintenance of Skills and Knowledge (25)	15.13	4.19	13.14	4.32	***	12.94	4.34	13.45	4.45	12.60	4.54	12.56	4.21
Application of Skills and Knowledge (30)	19.15	4.84	17.11	5.20	***	16.93	5.26	17.01	5.34	16.54	5.50	16.33	5.35
Meaning of Learning (25)	15.09	4.50	13.98	4.30	**	13.96	4.48	14.12	4.37	14.04	4.72	14.05	4.43

*Note:* <sup>a</sup>Students can report more than one type of SEN. Thus the number of students with SEN is not equal to the sum of students with ADHD, ASD, SpLD, and SLI. Significance levels were compared between TD students and students with SEN, n.s. = no significant difference, \* = two

groups were significantly different at 5% level of significance, \*\* = two groups were significantly different at 1% level of significance, \*\*\* = two groups were significantly different at 0.1% level of significance.

Table 3.7. *Online learning effectiveness between TD students and students with SEN from the perspectives of students (n = 254)*

Variable (maximum score of the variable)	TD Students		Students with SEN <sup>a</sup>		Significant difference between TD and SEN	Students with ADHD		Students with ASD		Students with SpLD		Students with SLI	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
	(n = 96)		(n = 158)			(n = 81)		(n = 62)		(n = 57)		(n = 61)	
Preparation Phase													
Learning Goals (25)	14.99	4.51	13.71	4.64	*	14.25	4.66	13.87	5.06	13.60	4.45	12.38	4.96
Prerequisites (25)	16.52	4.11	14.51	4.80	***	14.94	4.65	14.34	4.98	14.22	4.88	13.41	5.20
Environmental Structuring (25)	17.20	3.86	16.26	4.88	n.s.	16.53	4.92	16.61	5.11	16.14	4.60	15.70	5.28
Learning Environment (25)	16.72	3.41	14.91	4.53	***	15.27	4.28	15.58	4.71	14.40	4.30	13.93	5.11
Performance Phase													
Time Management (25)	16.50	4.02	14.25	4.82	***	13.95	4.82	14.87	5.05	13.72	4.46	13.15	5.30
Engagement in Learning Activities (25)	15.81	4.65	14.19	5.00	*	14.23	4.77	14.63	5.44	13.89	4.84	13.15	5.24
Persistence (25)	16.21	4.08	13.36	4.52	***	13.11	4.26	13.63	5.12	13.19	4.69	12.34	4.88
Interaction between teachers and students (30)	18.47	5.35	16.52	6.28	*	16.86	6.24	16.73	6.77	16.81	6.34	15.13	6.87
Interaction among students (25)	14.35	5.22	12.27	5.55	***	12.23	5.68	11.48	5.34	13.39	5.88	11.38	5.47
Feedback from the interface (25)	15.20	4.53	13.52	4.88	**	13.36	4.56	13.97	5.34	13.46	4.56	12.46	5.33
Transfer Phase													
Maintenance of Skills and Knowledge (25)	15.55	4.36	13.66	4.80	**	14.07	4.64	13.97	4.88	13.17	4.89	12.25	5.15
Application of Skills and Knowledge (30)	19.01	5.00	17.93	5.81	n.s.	18.56	5.57	18.50	6.22	18.04	5.92	16.51	6.46

Meaning of Learning (25) 15.59 4.60 15.16 4.72 n.s. 15.93 4.47 13.90 4.77 15.42 4.63 14.18 4.94

*Note:* <sup>a</sup>Students can report more than one type of SEN. Thus the number of students with SEN is not equal to the sum of students with ADHD, ASD, SpLD, and SLI. Significance levels were compared between TD students and students with SEN, n.s. = no significant difference, \* = two groups were significantly different at 5% level of significance, \*\* = two groups were significantly different at 1% level of significance, \*\*\* = two groups were significantly different at 0.1% level of significance.

Table 3.8. *Online learning effectiveness between TD students and students with SEN from the perspectives of teachers (n = 101)*

Variable (maximum score of the variable)	TD Students		Students with ADHD		Students with ASD		Students with SpLD		Students with SLI		Significant difference between TD and SEN
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Preparation Phase											
Learning Goals (10)	6.66	1.38	5.68	1.44	5.54	1.46	5.33	1.52	5.49	1.47	***
Environmental Structuring (10)	6.45	1.51	5.08	1.91	5.20	1.80	5.41	1.73	5.44	1.63	***
Learning Environment (5)	3.26	.70	2.77	.68	2.78	.74	2.74	.80	2.86	.69	***
Performance Phase											
Time Management (10)	6.16	1.50	4.75	1.40	4.74	1.57	5.02	1.48	5.24	1.48	***
Engagement in Learning Activities (5)	3.36	.84	2.31	1.09	2.47	1.04	2.47	1.00	2.73	.97	***
Interaction between teachers and students (10)	6.45	1.43	5.46	1.45	5.01	1.71	5.09	1.54	5.15	1.63	***
Interaction among students (10)	5.82	1.66	4.53	1.94	4.01	1.84	4.50	1.71	4.18	1.92	***
Feedback from the interface (10)	6.71	1.28	6.24	1.38	6.13	1.59	5.99	1.58	6.10	1.51	***
Transfer Phase											
Application of Skills and Knowledge (10)	6.33	1.59	5.06	1.80	4.73	1.69	4.59	1.80	4.90	1.85	***
Meaning of Learning (10)	6.95	1.50	5.78	1.89	5.52	1.85	5.46	1.88	5.59	1.82	***

*Note:* <sup>a</sup>Teachers did not rate on students with SEN overall.

Significance levels were compared between TD students and students with SEN, n.s. = no significant difference, \*\*\* = two groups were significantly different at 0.1% level of significance.



- 3.11 First, the analysis was conducted to compare typically developing students and students with SEN from the caregivers', students' and teachers' perspectives. From the caregivers' perspective, students with SEN had significantly lower performance in all phases of online learning than typically developing students, including learning goals (difference = 1.38), prerequisites (difference = 1.11), environmental structuring (difference = 0.97), learning environment (difference = 1.30), time management (difference = 1.48), engagement in learning activities (difference = 1.52), persistence (difference = 2.21), the interaction between teachers and students (difference = 2.03), interaction among students (difference = 1.05), feedback from the interface (difference = 1.15), maintenance of skills and knowledge (difference = 1.99), application of skills and knowledge (difference = 2.04), and meaning of learning (difference = 1.11).
- 3.12 From the students' perspective, students with SEN had significantly lower performance in all subscales in the performance phase and most subscales in the preparation phase and transfer phase than typically developing students, including learning goals (difference = 1.28), prerequisites (difference = 2.01), time management (difference = 2.25), engagement in learning activities (difference = 1.62), persistence (difference = 2.85), the interaction between teachers and students (difference = 1.95), interaction among students (difference = 2.08), feedback from the interface (difference = 1.68) and maintenance of skills and knowledge (difference = 1.89). No significant difference was found in environmental structuring, application of skills and knowledge and meaning of learning between students with SEN and typically developing students.
- 3.13 From the teachers' perspective, students with SEN had significantly lower performance in all phases of online learning than typically developing students. These results showed teachers and caregivers rated students with SEN had lower online learning effectiveness than typically developing students for all aspects of learning.
- 3.14 The next step was to evaluate the difference in online learning effectiveness between various SEN subtypes. From the caregivers' perspective, no significant difference was noted between students with ADHD, ASD, SpLD and SLI in all thirteen aspects of online learning effectiveness. From the students' perspective, no significant difference was noted between students with ADHD, ASD, SpLD and SLI in all thirteen aspects of online learning effectiveness. However, from the teachers' perspective, students with ADHD and ASD had significantly lower time management skills than students with SpLD and SLI (ADHD: 4.75; ASD: 4.74; SpLD: 5.02; SLI: 5.24). Furthermore, students with ADHD had a significantly lower engagement in virtual class activities than students with other types of SEN (ADHD: 2.31; ASD: 2.47; SpLD: 2.47; SLI: 2.73). For other aspects of online learning effectiveness, no significant difference was found between students with ADHD, ASD, SpLD and SLI from the teachers' perspective.

## Findings from Interviews

3.15 A total of 25 pairs of caregivers and students, and 21 teachers participated in the structured interview study. All of them were recruited from the participants in the questionnaire survey study. All students had at least one SEN subtype. Table 3.5 presented the socio-demographic details of the caregiver and student pairs. In the teachers' sample, the average year of teaching experience is 5.52 ( $SD = 4.91$ ), and 7 of them (33.3%) received professional training on SEN by the Education Bureau. 5 of them (23.8%) held SEN-related positions, and all of them had experience in teaching students with SEN and online teaching experience. Table 3.6 presented the demographic details of the teacher participants.

Table 3.5. *Socio-Demographic profile of the caregivers and students in the interview study (n = 25 pairs).*

Variable	Number of participants
Grade of the student	
Grade 1	2 (8%)
Grade 2	6 (24%)
Grade 3	5 (20%)
Grade 4	3 (12%)
Grade 5	4 (16%)
Grade 6	5 (20%)
Sex of the student	
Male	16 (64%)
Female	9 (36%)
Relationship with the student (for the caregivers)	
Mother	23 (92%)
Father	1 (4%)
Others	1 (4%)
Special educational needs of the student <sup>a</sup>	
Specific Learning Difficulties	10 (40%)
Autism Spectrum Disorders	9 (36%)
Attention Deficit/ Hyperactivity Disorder	11 (44%)
Speech and Language Impairment	8 (32%)

Note: <sup>a</sup>Can choose more than one option.

Table 3.6. *Socio-demographic profile of the teachers in the interview study (n = 21).*

Variable	Number of teachers
Position	
Teacher	15 (71.4%)
SEN support teacher	4 (19.0%)
SEN coordinator	1 (4.8%)

Curriculum leader	1 (4.8%)
Grade(s) taught <sup>a</sup>	
Grade 1	17 (81.0%)
Grade 2	4 (19.0%)
Grade 3	13 (61.9%)
Grade 4	10 (47.6%)
Grade 5	8 (38.1%)
Grade 6	6 (28.6%)
Professional development related to special educational needs <sup>a</sup>	
Basic course	7 (33.3%)
Advanced course	3 (14.3%)
Thematic course	3 (14.3%)
Subject(s) taught <sup>a</sup>	
Chinese Language	8 (38.1%)
English Language	2 (9.5%)
Mathematics	7 (33.3%)
General Studies	7 (33.3%)
Music	6 (28.6%)
Visual Arts	5 (23.8%)
Physical Education	1 (4.8%)
Putonghua	6 (28.6%)
Sex of the teacher	
Male	18 (85.7%)
Female	3 (14.3%)
Special educational needs of the student <sup>a</sup>	
Specific Learning Difficulties	16 (76.2%)
Autism Spectrum Disorders	19 (90.5%)
Attention Deficit/ Hyperactivity Disorder	20 (95.2%)
Speech and Language Impairment	15 (71.4%)
Physical Disability	1 (4.8%)
Visual Impairment	1 (4.8%)
Intellectual Disability	6 (28.6%)
Hearing Impairment	4 (19.0%)
Mental Illness	0 (0%)

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*Note:* <sup>a</sup>Can choose more than one option.

### *The aptitude of students during online learning*

3.16 Most students with SEN showed the digital technological ability to perform online learning and accomplish the required tasks, which was confirmed by different stakeholders.

“I was able to conduct online learning on my own because I had an iPad. This made online learning easier.” (P03, the student with SLI, Grade 5, Male)

“He knew well about lesson schedules. He was able to turn on the computer and finish log-in procedures on his own without my help. For the homework, I observed that he was able to handle it eventually.” (P03, the Caregiver of the student with SLI, Grade 5, Male)

“Some students were used to using iPad and different apps. They were even more familiar with those technologies than their teachers.” (T017, Teacher)

### Personal difficulties of students during online learning

3.17 Students reported to have lower motivation and willingness to learning that could be, in part, attributed to the lack of a classroom atmosphere in the online learning environment.

“Continuously reading idioms aloud was very boring. Teachers kept talking. Listening to them was very boring. I seldom raise hands. I did not want to raise hands because of boredom.” (P11, the student with ADHD, Grade 6, Female)

“She would choose to watch what was suitable for her. She would watch it on her own. She felt bored. She thought she could not focus on what teachers said, so she quickly went to other websites.” (P11, the caregivers of the student with ADHD, Grade 6, Female)

“Public pressure was a problem since having classmates next to me and looking at the screen were different. Although the whole class was doing the same thing at the same time, actually the student felt alone. This was the problem. Therefore, the extent of being out focused on students was very great when doing online learning because they could delete or turn off the camera. They could do what they liked.” (T07, the teacher)

### Environmental difficulties of students during online learning

3.18 Due to practical reasons (e.g., potential interruption to class, connections problems, and technological difficulties), students’ interaction was severely restricted in the online learning environment, resulting in reduced opportunity for friendship building and peer interaction and learning.

“Children with SEN needed an interactive context. In online learning, she did not have the opportunity to chat with his classmates. Hence, she was unfamiliar with her classmates. As my child was an introvert, she could not recognise all of her classmates even after a school year. Even later going back to school, she might only know the students sitting around her but could not recognise those sitting far away from her. Because she could not communicate or chat with the classmate sitting next to her. She did not have any news of that classmate as well. She was not happy with it. (P05, a Caregiver of the student with ADHD, SpLD, and SLI, Grade 6, Female)

“In my opinion, social interaction would be the biggest problem. It was different to learn face-to-face and through an online medium. Besides, I am not good at looking at

the facial expressions of others. It became more difficult now because people were wearing masks, and I had to observe through a computer screen. This was the thing I worried the most.” (P01, a Student with ASD, ADHD and SLI, Grade 3, Male)

“I was more alone, and it was more boring for the online classes. When we had face-to-face classes, the classroom would be noisier, and I would not feel bored. When I was bored during the online learning period, I would wait until the end of the last lesson and wait for the chance to chat with my classmates. Because after the last lesson, teachers would end the lesson first but not end the online session immediately. Thus, I would be able to chat with the classmates that did not leave the session.” (P02, a Student with SpLD, Grade 2, Male)

3.19. The immediate feedback and game-like environment attracted students attention, and help motivate students to learn actively and engaged during online lessons.

“The screen was colourful, and there were sound effects in the games. When she answered the question correctly, there would be sounds to excite him. Also, the screen colours were sharp. This attracted her attention. Additionally, those games would give instant and quick responses. For example, it would tell her her ranking immediately after she answered the question.” (P08, a Caregiver of a student with ASD, Grade 5, Female)

“E-class was helpful. He could do some tasks there, and teachers would mark them. He would check whether he did it correctly or not. As there was a time limit, he could finish all the questions. If there were class rankings or grades, he would be more active because he liked the competition of marks. Those marks were attractive to him. He could obtain more marks by completing tests and logging in. He was aware of these.” (P24, a Caregiver of a student with ASD and SLI, Grade 6, Male)

### The academic outcome of students during online learning

3.20. Most students reported that their academic results worsened after online learning because of their difficulties in memorizing the knowledge learnt and the lack of practice effect. This was further confirmed with reference to the caregivers’ and teachers’ responses.

“If we used Zoom for learning, it would be hard to remember things because we might not be able to remember what we had covered since we seldom wrote notes.” (P09, A student with ASD, Grade 6, Female)

“Sometimes we were like goldfish which might not recall (what we had learnt) immediately nor remember them for a long time. The memories would last for a longer period if we learnt at school because teachers might have facial expressions and movements that could impress me. Teachers would write on the whiteboard. However, for online learning, the teacher skipped one to another question once the teacher clicked. I might not finish copying the previous question. I would miss some information.” (P25, a student with SpLD, Grade 4, Male)

### Difficulties of students during online learning by SEN subtypes

3.21. Students with ADHD had difficulties in staying focused during lessons, which lead them to have problems in participating in learning activities and being distracted by other non-learning-related information.

“Since this child was young , his ability of self-control was weak. He might also be relatively curious, so I spent more time watching them (my children) having lessons. Since the screen on the Internet was too big, if you did not monitor his situation in class, he would have curiosity and the ability to use Google. He would easily click anything randomly and browse further and further. He might click the link to some inappropriate website ..” (P10, a Caregiver of the child with ADHD, Grade 2, Male)

“Actually, it was easy to know whether he had engaged in his lesson. If he engaged in lessons, he would talk all the time. However, if he did not, in other words, if you saw it was a quiet lesson, and nothing happened, that meant he was watching something else. Of course, in this situation, I would usually ask him questions.” (T02, a Teacher)

3.22. Students with ASD reported to have difficulties in learning social skills during online learning and adopting social rules in the online learning environment.

“He did not know about social skills, like interpreting others’ facial expressions and actions. For example, he did not understand why others disliked or why they did that, and then he came to tell me. Those problems that he did not understand about others appeared during online class. He lacked those experiences that helped him grow up. The reason was that if there were face-to-face lessons, his social skills could build up. However, conducting online learning reduced the social interaction opportunities. He might not learnt much, but other students did grow up, became more mature. He no longer expressed his thoughts like what he did when he was a primary one student. He would come to tell me that he felt something strange. For example, he tried to say that he did not understand why the girl in his class was crying or why his classmates were angry. These were very easy for us to understand, but he thought there was nothing to cry for. He could not easily understand these feelings. Therefore, I had to analyze these for him because he originally had some self-interpretation. It was difficult and harsh for him since he did not interpret these thoughts for a year.” (P09, a Cargiver of a student with ASD, Grade 6, Male)

“In my opinion, children with ASD did not want to turn on their camera at the beginning because they thought that their classmates could peep at their house through the camera. This had intruded on their privacy and made them feel uncomfortable. After we understood the situation, we allowed those students to turn off the camera during lessons. But we knew that their families were following up on their situation. For example, their mothers would accompany them to attend the online lessons. When we ensured that those students were paying attention in class, we could permit them to turn off the camera. Besides, they were not willing to answer the questions sometimes

because they thought that everyone was listening to them and they were on the spotlight focus among their classmates. This would be a kind of pressure to them.” (T15, Teacher)

3.23. As the emphasis was placed on digital medium instead of hand writing during online learning, students with SpLD reported to have more difficulties in acquiring and practising literacy skills, especially for writing and understanding the meaning of Chinese characters in the online learning platform.

“In the past, he wrote more because of the hardcopy homework. But for now, homework was submitted to an online format. I even did not know whether he had done his homework or not.” (P20, a Caregiver of the child with SpLD, Grade 5, Male)

“His writing ability got worse after online learning. He seemed not to know how to write the characters. Also, ... his overall writing ability including writing passages and sentences got worse.” (T02, a Teacher)

“If teachers did not show clearly how to write the characters through the screen, children with SpLD would be more likely to write them wrong. Even typically developing children kids would also have a higher chance of writing words wrongly because they wrote less and had less handwriting homework during online learning. As we would only circle the incorrect characters in homework marking, students only knew which character they were writing wrong but did not have to do corrections afterwards. Hence, they would be more likely to write words wrongly as compared to face-to-face teaching in which they have to do the correction for their writing mistakes afterwards.” (T01, Teacher)

3.24. Due to their language weaknesses, students with SLI experienced difficulties expressing themselves during online learning. In particular, the unstable network and limited time hindered them from expressing their views and restricted teachers’ support of them.

“My child was passive even during face-to-face lessons. He was more passive in online learning because he thought that his teacher could not see him. For example, when the teacher was asking who could not receive the homework, he did not tell the teacher that he did not have the homework with him. Instead, he would ask me to go to school and collect the homework for him after class. As he was too shy, he was not brave enough to ask his teacher in class. Also, it seems not so good for me to tell his teacher in class that my son did not have the homework. It turned out that I had to find his teacher and ask for his homework because he needed to submit it later.” (P03, a Caregiver of the Student with SLI, Grade 3, Male)

“I think it was the same as face-to-face lessons. We had to give more encouragement for them to speak because they would face communication difficulty no matter in an online or a face-to-face environment. However, the technological support would be worse during online learning because they were having lessons at home. Thus, this

would hinder the expression of their ideas more. For example, when they had tried very hard to construct a sentence, but their teachers could not listen to it. Clearly, he would not want to repeat it again.” (T07, Teacher)

3.25. Students with multiple SENs reported to have more difficulties in terms of learning skills and knowledge gained during online learning to students with one type of SEN. Relative to face-to-face teaching, teachers and caregivers reported to face greater difficulties to engage these children during online learning. Support for emotional and attention management were necessary to enhance online learning effectiveness.

“Mood and emotional disturbances were more evident. SEN children very easily showed frustration because of their challenges. My daughter easily lost her temper during online learning. Thus, in additiona to being afraid of mistakes, emotion management was also a problem for SEN children. Because my daughter was not in a good mood, even if you did something or said something, she was likely pulling down her shutter, never listening to what you said. However, until she had a better mood, she could normally continue learning. This was the biggest problem for my daughter.” (P05, Caregivers with ADHD, SpLD, SLI, Grade 5, Female)

“Their daydreaming issues were so serious. Even if you asked him a question, he would never answer. On the aspect of learning, they originally had obstacles and difficulties. If there were no adults next to them, it was hard for them to concentrate. When I taught them the stroke order rules of Chinese character writing, they also had difficulties in mastering them. Maybe the directions of the screens were not the same. This made them hard to understand. Usually, I spent a lot of time teaching in the classroom, but I could not teach well via online learning, even I tried hard. In addition, even if I used applications to read aloud the passages, it still had differences from personal reading of the passages sentence by sentence. This affected their understanding and assimilation. However, it was difficult to teach them sentence by sentence online, as I had to take care of other students without SEN. I could only ask them to listen and read the passages more sentence by sentence. They were weak in concentrating during class.” (T018, a Teacher)



## **Chapter 4 Discussion and Implications**

- 4.1. This chapter provided a summary of the key findings of the quantitative and qualitative study. We first discussed the difference in online learning performance between typically developing students and students with SEN, followed by the discussion of, the overall difficulties faced by students with different subtypes of SEN and their differences, and the difficulties faced by caregivers and teachers.

### **The Difference in Online Learning Performance between Typically Developing Students and Students with SEN**

- 4.2. Regarding online learning attitude, a difference existed between students and caregivers and between students and teachers. While students with SEN rated themselves had a significantly higher affection score comparing with typical developing students, specifically, negative emotions, during online learning, the caregivers rated students with SEN had significantly lower online learning attitudes scores except for the development subscale. Furthermore, teachers rated students with SEN had lower overall online learning attitudes scores in all aspects. Such difference can be explained with reference to the qualitative study. Students with SEN enjoyed the screen display and game-like environment in the online learning environment, which allowed them to have higher learning motivation. However, they suffered from negative emotions, which was explained by the reduced interaction among students and between teachers and students. However, from the caregivers' perspective, students with SEN did not show sustained attention and motivation towards online learning. They thought students with SEN were easily distracted by the other websites and home environment. Thus, their view of online learning attitudes towards students with SEN was less positive when comparing with TD students. From teachers' perspective, some of them had the experience of students with SEN not participating or showing up during online learning. Also, some students with SEN were not willing to turn on their cameras. Thus, teachers perceived that students were less motivated by online learning comparing with TD students.
- 4.3. Regarding online learning effectiveness, students with SEN rated themselves with significantly lower effectiveness than their typically developing peers for most of the subscales except for the transfer phase. Caregivers and teachers rated the effectiveness of online learning for students with SEN significantly lower than their typically developing peers. From the caregivers' and teachers' perspectives, they found that students with SEN were not able to concentrate and be attentive during online learning. Thus, they believed the engagement of students with SEN during online learning would be lower. As a result, they were more likely to have a lower academic outcome compared to their age-matched peers.

### **Common Facilitators and Difficulties of Online Learning Faced by Students with SEN**

- 4.4. Based on the structured interview results, three major facilitators that were suggested by students with SEN and their caregivers were identified. First, it was the game-like

activities during online learning. Some online applications provided students with a platform to complete questions with a time limit and in a competition format. The advantages of it included special audio and visual effect which helped to actively engage students with SEN. This is because students with SEN often had lower attention span. If they were allowed to play the games frequently, they will be more engaged to the online learning.

- 4.5. The second facilitator was the multi-media information. Students with SEN often had lower attention span which require changes on the types of information input. The story plot, visual movement and audio effect of the multi-media materials can help students to visualize some abstract concepts and allow teachers to explain the key learning points again. With the story plot of the videos, some students found them easier to memorize the concepts and knowledge.
- 4.6. The third facilitator was the diversity of the online learning platforms. The online learning platforms include Chinese and English reading programs, Putonghua speaking practice, mathematics concept questions, etc. Students with SENs were engaged in these platforms because of the reward system and the immediate grading system. Some students with SENs reported this can help them build up a habit of learning.
- 4.7. However, teachers, caregivers and students with SEN reported that their lower concentration was one of the barriers during online learning. Students with SEN were easily distracted during online learning. The distractors include the home environment and the internet.
- 4.8. As for the internet, students can access other websites or game applications during online learning. Because the real-time online learning platform only uses the camera in the device to reflect the presence of the students, some students may browse the internet, watch videos, play video games, or even turn their camera off to escape from the teachers' check.
- 4.9. The second challenge faced by students with SEN was the reduced interaction between teachers and students and among students. Students reported that they had less chance to interact with their classmates during online learning, and they would like to have more interaction during class. Caregivers of students with SEN were worried about the social development of their children. They reported that students with SEN might need more time to adapt to the social rules and environment during online learning. Furthermore, from the teachers' perspective, due to the reduced lesson time, the restrictions of individual support and no face-to-face communication, teachers reported to have difficulties interacting with students with SEN. Thus, teacher perceived it difficult to fully understand the challenges faced by students with SEN.

## **The Difference in Online Learning Performance between SEN Subtypes**

- 4.10. Based on the interview study, students with ADHD had difficulties in concentrating during online learning. This was reflected by the significantly lower rating of engagement during online learning activities from the teachers' perspective in the survey study. Caregivers and teachers reported that modifications or learning support policies for face-to-face teaching, including sitting in the front of the classroom, visual cues, peer reminders, etc., were no longer available in online learning.
- 4.11. According to the results of the survey study, teachers reported that students with ASD had significantly more negative emotions than those with other types of SEN. This may be explained by the ineffective social communication during online learning. In interviews, caregivers of the students with ASD and students with ASD reported difficulties in answering questions during online lessons and interacting with peers. Thus, caregivers worried about their child social development. In addition, the camera of the online learning platform usually captures the face of the students with low resolution. Thus, caregivers of students with ASD reported that students had difficulties in comprehending the message of nonverbal communication means such as facial expressions, body language and gestures, etc., which hindered their communication effectiveness.
- 4.12. On the basis of the structured interviews, caregivers of children with SpLD and teachers reported that relative to face-to-face teaching, those students' literacy development was slower during online learning. Although students with SpLD can use the speech-to-text function and word suggestion choice online, this cannot replace handwriting skills. Thus, no adequate writing practice was provided for students with SpLD during online learning, which impeded writing skills of those students.

## **Difficulties Faced by Caregivers and Teachers**

- 4.13. According to the structured-interview, the caregivers faced two major difficulties in supporting their children with SEN's online learning. First, caregivers had to monitor the students' online learning. Some caregivers reported that they might sit beside the students during online learning, especially if the students were in lower grades and some students with SEN had lower attention span. They need to be aside to provide technical support, assist the learning process and ensure that their children were attentive during the learning. Thus, they reported that this increased their workload.
- 4.14. Another difficulty raised by the caregivers of students with SEN was less SEN support from school. Given the pandemic, a lot of SEN-related support service had been suspended or changed into online format. However, caregivers reported that the effectiveness of these programs were lower than in-person format. Thus, they had to think of their own way in supporting the learning of students with SEN.

- 4.15. According to the structured-interviews, teachers reported two major difficulties during online learning. First, teachers reported that they had to redesign the class activities for the online mode. In particular, teachers reported the redesigned class mainly focused on medium level of content. For students with SENs, some might require more support or basic level of content to understand learning concepts. The redesigned class might not be able to address their needs and they might feel difficult in catching up the learning pace.
- 4.16. The second challenge faced by teachers was communication with students. In the interviews, teachers reported that they could communicate and interact with students in school during face-to-face teaching. However, during online learning, teachers were unable to communicate with students with SENs. Thus, even students with SENs had negative emotions or require extra care, teachers found it difficult to notice and address immediately. In addition, teachers showed concerns and difficulties to contact and counsel those students who were consistently absent from online learning classes, which was mainly students with SENs.

## Chapter 5 Conclusions and Recommendations

- 5.1. This chapter provided several key recommendations to promote a more inclusive and effective online learning environment. To enhance effectiveness of the online learning experience of students with SEN, different stakeholders including the Government, schools, teachers and students may consider the following aspects.
- 5.2. At the Government level, it is necessary to allocate more research funding to support research scientists to use evidence-based scientific method and cutting-edge technology to develop an online game-like platform for learning different subjects. In particular, the game-like activities with individualized feedback, multi-media information and diversity of learning activities should be emphasized in the online learning system.
- 5.3. A unified learning platform for all subjects is necessary because this will help ease caregivers' and students' difficulties in learning and managing the learning process of various sites.
- 5.4. Furthermore, an online learning support system is important for students, teachers, and caregivers. Also, the online learning support system would enable teachers and caregivers to find their solutions when they encounter technological and other difficulties during online learning. Additionally, more sharing workshops for schools can be organized to share their successful experience in assisting online learning for students with SEN at the across-school level and within-school level. Thus, teachers can make reference to other schools' successful experiences.
- 5.5. For students with SEN, schools can consider other support measures, including after school support, small class teaching, and learning video review. When implementing online learning, extra resources are required to provide individual or group learning support to students with SEN.
- 5.6. Teachers can consider the following measures to support students' online learning. First, teachers are encouraged to attend courses related to SEN in their own professional development. This allows them to keep up with the latest evidence on educating students with SEN. Second, teachers can share their experiences with other colleagues and design learning activities together. This helps reduce teachers' workload and increase the collaboration among teachers. Third, teachers can consider providing additional support measures to students with SEN. Teacher can also provide structured guidance materials for home-teaching for caregivers that supplement the materials for students.
- 5.7. For students with ADHD, teachers can occasionally check whether they are attentive or not. This can let the students feel engaged in the lesson and keep their concentration. For students with ASD, teachers can provide chances for them to practice social skills including rehearsing group discussion skills, inviting them to comment during lessons, and chatting with them after class. For students with SpLD, the handwriting skills can be addressed by enlarging the font size and emphasizing the stroke order of Chinese

characters. For students with SLI, teachers can consider inviting them to answer questions corresponding to their ability level so they can answer correctly to build up their confidence.

- 5.8. Caregivers should continue to communicate with teachers and exchange information on the child's performance during online learning. Caregivers can consider following teachers' and other professionals' advice to support their child's online learning. After the adoption, caregivers can record and provide feedback to see if modifications are needed. In addition, caregivers of students with SEN can consider participating in workshops offered by school or other parent support groups to learn learning support techniques.

## **Conclusions**

- 5.9. Students with SEN faced a wide range of challenges during online learning, including lower online learning attitudes with negative emotions, ineffective learning experience, low concentration during online lessons and reduced learning support. Despite these difficulties, online learning exhibited certain merits, including game-like activities, multimedia materials and immediate feedback from the online learning platforms. More work is needed to utilize these advantages to effectively support students with SEN in order to make the online learning environment barrier-free, and ultimately enhance the effectiveness of online learning for students with SEN.

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Appendix 1. Questionnaire for Caregivers and Students.

A) Implementation of Online Learning

- a) Have you received any online learning services? (Yes/No)
- b) If yes, please indicate the grade of the first time you received online learning services. (Kindergarten 1/2/3/ Primary 1/2/3/4/5/6)
- c) Through which of the following platforms have you received online learning services? (Please indicate all that apply)  
 School email/ Online teaching materials (including e-book)/ Learning management system (including Google Classroom, Microsoft Teams, VLE, Edmodo, Schoology)/ Online learning video/ Online assessment/ Real-time online teaching (including Zoom, Google Meet, Microsoft Teams)/ Others: (please specify) \_\_\_\_\_
- d) Which of the following subjects have you studied using online learning? (Please indicate all that apply)  
 Chinese Language/ English Language/ Mathematics/ General Studies/ Music/ Visual Arts/ Physical Education/ Putonghua  
 Others (please specify) \_\_\_\_\_
- e) How frequent have you used online learning services through the following methods?

Types	Never	Less than once a week	Once a week	Two to four times a week	Five or more times a week	Only used during class suspension
School email						
Online teaching materials (including e-book)						
Learning management system (including Google Classroom, Microsoft Teams, VLE, Edmodo, Schoology)						
Online learning video						
Online assessment						
Real-time online teaching (including Zoom, Google Meet, Microsoft Teams)						
Others (please specify)						

- f) Please rate your satisfaction of the following online learning services.

Types	N/A	1-very dissatisfied	2- somehow dissatisfied	3- No opinion	4- somehow satisfied	5- very satisfied
School email						



Online teaching materials (including e-book)						
Learning management system (including Google Classroom, Microsoft Teams, VLE, Edmodo, Schoology)						
Online learning video						
Online assessment						
Real-time online teaching (including Zoom, Google Meet, Microsoft Teams)						
Others (please specify)						

- g) Do you have your own device for using online learning services? (Yes/No)  
 If no, please choose how you receive online learning services (Please indicate all that apply)  
 Share a device with other family members/ Borrow a device from friends or relatives/ Borrow a device from school/Others: \_\_\_\_\_ (Please specify)
- h) What type of device have you used to receive online learning services? (Please indicate all that apply)  
 Mobile phone/ Tablet/ Laptop or desktop computer  
 Others (please specify) \_\_\_\_\_
- i) At what location have you received your online learning services (Please indicate all that apply) Home/ school / public library / coffee shop/ others (please specify)\_\_\_\_\_
- j) Which of the following location is the most frequent location that you received online learning services this year? Home/ school / public library / coffee shop/ others (please specify)\_\_\_\_\_
- k) If you mainly received online learning services at home, please rate the statements below:
- Internet connection at home (1-very poor; 2-poor; 3-fair; 4-good; 5-excellent)
  - Audio quality for real-time online classes? (1-very poor; 2-poor; 3-fair; 4-good; 5-excellent; N/A- not applicable)
  - Video quality for real-time online classes? (1-very poor; 2-poor; 3-fair; 4-good; 5-excellent; N/A- not applicable)

B) Attitude of Online Learning (Please rate on 5-point Likert score; 1-strongly disagree; 2-disagree; 3-netural; 4-agree; 5-strongly agree)

a) Enjoyment

1. I enjoy learning online.
2. I enjoy learning online because it is new to me.
3. I enjoy learning various topics and subjects online.
4. I enjoy the multimedia information provided by online learning services.
5. I enjoy learning online in Chinese.
6. I enjoy learning online in English.
7. Learning online is a habit of mine.
8. I would like to receive online learning services in the future.

b) Utilization

1. I use online learning services to learn a topic or subject in depth.
2. Learning online is good for my academic performance at school.
3. Learning online is good for the development of my learning skills (e.g., time management skills, summarization skills, asking questions).
4. My learning skills (e.g., time management skills, summarization skills, asking questions) are improving after learning online.
5. I can learn fast online.

c) Development

1. I know more when I learn online than in the classroom.
2. I know what I do not know when I learn online.
3. I know what I am interested in when I learn online.
4. I know what I am not interested in when I learn online.
5. I know my dream more when I learn online.
6. I know myself more when I learn online.
7. I know my learning style when I learn online.
8. I know what I would like to explore more when I learn online.

d) Affection

1. I would feel anxious if I did not understand the content of online learning programs.
2. I would feel nervous if I did not get the answer correct in online learning programs.
3. I would feel worried if there were lots of content in online learning programs.
4. I would avoid online learning services/programs if possible.
5. I would avoid long periods (e.g., whole day) of online learning.
6. I have difficulties concentrating during online learning services/programs.

e) Motivation

1. I want to learn more when I learn online, as compared to in-classroom learning.
2. I do my best when I learn various subjects online.
3. I am excited when I receive real-time online learning services (e.g., Zoom, Teams, Google Meet, etc.).
4. I am excited when I receive online learning services on prepared materials (e.g., e-book, learning videos, online assessment, etc.).
5. I do my best when I receive online learning assessments.
6. I would like to receive online learning services outside regular school hours.

7. I have a higher motivation to learn when learning online, as compared to face-to-face learning.

C) Effectiveness of Online Learning (Please rate on 5-point Likert score; 1-strongly disagree; 2-disagree; 3-neutral; 4-agree; 5-strongly agree)

a) Preparatory Phase

i. Learning Goals

1. I am aware of the learning goals of online learning services/programs.
2. I understand the learning goals of online learning services/programs.
3. The learning goals are appropriate for online learning services/programs.
4. The learning goals help me understand the content of online learning services/programs.
5. I am confident in achieving the learning goals after receiving the online learning services.

ii. Prerequisites

1. I know what skills and knowledge are needed for receiving online learning services.
2. I am equipped with the skills and knowledge that are needed for receiving online learning services.
3. Prerequisite questions or learning activities are provided in online learning services.
4. Prerequisite questions or learning activities enhance of the effectiveness of online learning.
5. I will do revision on the prerequisite skills and knowledge when necessary before I start online learning activities.

iii. Environmental Structuring

1. I can find a place that I can concentrate when receiving online learning services.
2. I have a regular place for receiving online learning services.
3. I am not easily distracted when using the online learning platform.
4. Online learning platform do not have redundant sounds or videos.
5. I am satisfied with the learning environment that I have when receiving online learning services.

iv. Learning Environment

1. Online learning platform(s) is(are) easy to use.
2. The layout of online learning platform(s) is(are) organized.
3. The online learning platform(s) has(have) minimal distractions.
4. The online learning platform(s) has(have) minimal redundant sounds or graphics information.
5. I am capable to use different online learning platform(s).

b) Performance Phase

i. Time Management

1. I know how much time I have to spend on online learning services.
2. I can allocate enough time for online learning services without time clash with other activities.

3. I can allocate time suitable for online learning activities.
4. It is easy for me to schedule my time for providing online learning services.
5. I can complete the online learning activities on time.

ii. Engagement in Learning Activities

1. I am engaged in the online learning activities.
2. I had the feeling of 'participating' during online learning activities.
3. I am given enough opportunity to answer questions during online learning activities.
4. I am concentrated during online learning activities.
5. I am eager to learn during online learning activities.

iii. Persistence

1. I can maintain attention during the whole online learning activities.
2. I can finish the online learning activities required even I do not like the content.
3. I can finish the online learning activities required even I find the content challenging.
4. I find ways to force myself to complete the online learning activities.
5. When I feel bored during online learning activities, I force myself to concentrate.

iv. Interaction between teachers and students

1. I was able to interact with my teachers during online learning activities.
2. The interaction between teacher and I is adequate during online learning activities.
3. The interaction between teacher and I can facilitate online learning.
4. I can seek teacher's help whenever I need during online learning activities.
5. I know how to seek teachers' help during online learning activities.
6. Teachers are able to provide timely response to my questions during online learning activities.

v. Interaction among students

1. I was able to interact with my classmates during online learning activities.
2. The interaction between my classmates and I is adequate during online learning activities.
3. I enjoy the interaction between my classmates and I during online learning activities.
4. It was easy to interact with my classmates during online learning activities.
5. I can learn from my classmate during online learning activities.

vi. Feedback from the interface

1. I was able to receive feedback from the learning platform(s) during online learning activities.
2. The feedback received from the learning platform(s) is easy to find during online learning activities.
3. The feedback received from the learning platform(s) is adequate for me to continue to learn.
4. The feedback received from the learning platform(s) is helpful for me to learn.

5. The feedback received from the learning platform(s) allows me to further study on the topic.
  - vii. \*Academic Support to students
    1. I need to provide academic support to my child during online learning activities.
    2. I understand the content of online learning activities.
    3. I am competent in providing academic support to my child during online learning activities.
    4. I can provide timely academic support to my child during online learning activities.
    5. I think the amount of academic support provided to my child during online learning activities is appropriate.
    6. The amount of academic support provided to my child affects my daily routine at home.
      - viii. \*Behavioral Support to students
        1. I need to provide behavioral support to my child during online learning activities.
        2. I am competent in providing behavioral support to my child during online learning activities.
        3. I can provide timely behavioral support to my child during online learning activities.
        4. I think the amount of behavioral support provided to my child during online learning activities is appropriate.
        5. The amount of behavioral support provided to my child affects my daily routine at home.
- c) Transfer Phase
  - i. Maintenance of Skills
    1. I know what I have learnt from online learning activities.
    2. I remember what I have learnt from online learning activities after one week.
    3. I can recall the skills and knowledge learnt from online learning activities by verbal reminders.
    4. I can use the skills and knowledge learnt from online learning activities in assessments and examinations.
    5. I can recall the skills and knowledge learnt from online learning activities whenever needed.
  - ii. Application of Skills and Knowledge
    1. I can apply the skills and knowledge learnt from online learning activities in other subjects.
    2. I can apply the skills and knowledge learnt from online learning activities in daily life.
    3. It is easy to apply the skills and knowledge learnt from online learning activities on other subjects.
    4. It is easy to apply the skills and knowledge learnt from online learning activities in daily life.

5. I feel satisfied when I can apply the skills and knowledge learnt from online learning activities in other subjects.

6. I feel satisfied when I can apply the skills and knowledge learnt from online learning activities in daily life.

iii. Meaning of Learning

1. Learning online broadens my horizon.

2. Learning online motivates me to learn more.

3. Learning online makes me become an independent learner.

4. The skills and knowledge learnt from online learning activities are meaningful to my personal life.

5. I understand how I learn best when learning online.

D) Ways to improve online learning effectiveness

Please rate the following measures from 1 (least effective) to 5 (most effective).

1. Provide the outline and content of each session.

2. Provide a suggested time for each homework.

3. Provide a timer and reminder message on the online learning platform.

4. Provide a bar showing learning progress.

5. Reduce the distraction of the online learning platform.

6. Provide compulsory break during online learning.

7. Encourage discussion on online learning platform.

8. Provide extra video with clear step for review and facilitation of homework.

9. Provide quiz after class with immediate feedback and answer.

10. Provide worksheet after each class to consolidate the basic knowledge of the class.

11. Provide vocabulary sheet before class for revision.

12. Provide multimedia information to facilitate learning.

13. Encourage the use of online dictionary.

14. Provide audiobooks and word-to-text function.

15. Provide synonym list for revision.

16. Encourage the use of mind map.

E) Demographics

1. What is your relationship with the child? (Father/ Mother/ Other: (please specify) \_\_\_\_\_)

2. Parents' (father and mother) highest level of education and occupation: (Never received primary school education/ Some primary school education (did not graduate)/ Primary school graduate/ Secondary school graduate/ High school graduate/ University or college diploma/ University or college degree/ Graduate or professional degree /Other: \_\_\_\_\_)

3. Are you the child's main caregiver? (Yes/ No)

4. Which grade was your child in during the 2020-21 academic year? (Primary 1/ 2/ 3/ 4/ 5/ 6)

5. What is your child's gender? (Male/ Female)

6. Does your child have any of the following disorders? (Please indicate all that apply) (Attention deficit/hyperactivity disorder (AD/HD)/ Autism spectrum disorders (ASD)/ Hearing impairment/ Intellectual disability/ Mental illness/ Physical disability/

Specific learning difficulties (including dyslexia)/ Speech and language impairments (including those receiving speech therapy services in school)/ Visual impairment/ No special educational needs/ Other(please specify). \_\_\_\_\_)

7. How many children do you have? : \_\_\_\_\_
8. How many people live in your household? : \_\_\_\_\_
9. What is the size of your home? (<200 square feet/ 201-400 square feet/ 401-600 square feet/ 601-800 square feet/ 801-1000 square feet/ 1001 square feet or above)
10. Which type of home are you living in? (Self-owned/ Rental/ Government subsidized housing/ Other: \_\_\_\_\_)
11. Does your child have his/her own computer/tablet? (Not including mobile phone) (Yes/ No; If not, please state how your child participated in online lessons: \_\_\_\_\_)
12. Does your child have his/her own room or learning space? (Yes/ No; If not, please state where your child studies (e.g., do homework or revise for a test): \_\_\_\_\_)
13. Please indicate your current monthly family income: (<\$10,000/ \$10,001-20,000/ \$20,001-30,000/ \$30,001-\$40,000/ \$40,001-\$50,000/ \$50,001-\$60,000/ \$60,001-\$70,000/ \$70,000-\$80,000/ \$80,001-\$90,000/ \$90,001-\$100,000/ \$100,001 or above)

Note. The word “I” and “my children” is interchangeable depending on the caregivers and students’ version. The section with (\*) is only applicable to caregivers.

Appendix 2. Questionnaire for Teacher.

A) Implementation of Online Learning

- a) Have you provided any online learning to your students? (Yes/No)
- b) If yes, please indicate the year of the first time you provided online learning services.
- c) Through which of the following platforms have you provided online learning services? (Please indicate all that apply)  
 School email/ Online teaching materials (including e-book)/ Learning management system (including Google Classroom, Microsoft Teams, VLE, Edmodo, Schoology)/ Online learning video/ Online assessment/ Real-time online teaching (including Zoom, Google Meet, Microsoft Teams)/ Others: (please specify) \_\_\_\_\_
- d) Which of the following subjects have you taught using online learning? (Please indicate all that apply)  
 Chinese Language/ English Language/ Mathematics/ General Studies/ Music/ Visual Arts/ Physical Education/ Putonghua  
 Others (please specify) \_\_\_\_\_
- e) How frequent have you used online learning services through the following methods?

Types	Never	Less than once a week	Once a week	Two to four times a week	Five or more times a week	Only used during class suspension
School email						
Online teaching materials (including e-book)						
Learning management system (including Google Classroom, Microsoft Teams, VLE, Edmodo, Schoology)						
Online learning video						
Online assessment						
Real-time online teaching (including Zoom, Google Meet, Microsoft Teams)						
Others (please specify)						

f) Please rate your satisfaction of the following online learning services.

Types	N/A	1-very dissatisfied	2- somehow dissatisfied	3- No opinion	4- somehow satisfied	5- very satisfied
School email						



Online teaching materials (including e-book)						
Learning management system (including Google Classroom, Microsoft Teams, VLE, Edmodo, Schoology)						
Online learning video						
Online assessment						
Real-time online teaching (including Zoom, Google Meet, Microsoft Teams)						
Others (please specify)						

g) Please rate the statements below:

- a) Audio quality for real-time online classes? (1-very poor; 2-poor; 3-fair; 4-good; 5-excellent; N/A- not applicable)
- b) Video quality for real-time online classes? (1-very poor; 2-poor; 3-fair; 4-good; 5-excellent; N/A- not applicable)

B) Professional Support of Online Learning (Please rate on 5-point Likert score; 1-strongly disagree; 2-disagree; 3-netural; 4-agree; 5-strongly agree)

- i. Teaching Resources
  1. There are enough online learning resources available.
  2. There are enough multimedia online learning resources available.
  3. The teaching resources are suitable for my students.
  4. The teaching resources can cater for students with different abilities.
  5. The teaching resources do not require many amendments before being delivered to students.
- ii. School Support
  1. My school supports the use of online learning.
  2. My school provides enough technological support for online learning.
  3. The development of online learning materials is of high priority in my school.
  4. My school has colleague support groups for online learning.
  5. My school provides clear guideline for online learning.
- iii. Professional Training
  1. I had adequate training in providing online learning services.
  2. Professional training allows me to understand the points to note when providing online learning services.

3. I keep up with the latest development of online learning services.
  4. The professional training that I had was useful for me to provide online learning.
  5. I am confident in providing online teaching to my students.
- iv. Interface
1. The learning platform(s) is(are) easy for teachers to use.
  2. The learning platform(s) is(are) easy for teachers to provide online learning services to students.
  3. The learning platform(s) is(are) easy for teachers to provide different types of online learning materials to students.
  4. The learning platform(s) allow(s) teachers to view students' responses easily.
  5. The layout of online learning platform(s) of teachers' version is(are) organized.
- C) Attitude of Online Learning (Please rate on 5-point Likert score; 1-strongly disagree; 2-disagree; 3-neutral; 4-agree; 5-strongly agree)
- a) Enjoyment
    1. I enjoy learning online because it is new to me.
    2. I enjoy learning on various topics and subjects online.
    3. I enjoy the multimedia information provided by online learning services.
  - b) Utilization
    1. Learning online is good for the development of my learning skills (e.g. time management skills, summarization skills, asking questions).
    2. My learning skills (e.g. time management skills, summarization skills, asking questions) are improving after learning online.
  - c) Development
    1. I know what I do not know when I learn online.
    2. I know what I am interested in when I learn online.
    3. I know what I am not interested in when I learn online.
  - d) Affection
    1. I would feel anxious if I did not understand the content of online learning programs.
    2. I would feel worried if there are lots of content in online learning programs.
  - e) Motivation
    1. I will do my best when I learn various subjects online.
    2. I am excited when I receive online learning services on prepared materials (e.g. e-book, learning videos, online assessment, etc.).
- D) Effectiveness of Online Learning (Please rate on 5-point Likert score; 1-strongly disagree; 2-disagree; 3-neutral; 4-agree; 5-strongly agree)
- a) Preparatory Phase
    - i. Learning Goals
      1. I understand the learning goals of online learning services/programs.
      2. The learning goals are appropriate for online learning services/programs.
    - ii. Environmental Structuring
      1. Online learning platform do not have redundant sounds or videos.

2. I am satisfied with the learning environment that I have when receiving online learning services.
  - iii. Learning Environment
    1. The layout of online learning platform(s) is(are) organized.
  - b) Performance Phase
    - i. Time Management
      1. I can allocate enough time for online learning services without time clash with other activities.
      2. It is easy for me to schedule my time for providing online learning services.
    - ii. Engagement in Learning Activities
      1. I am concentrated during online learning activities.
    - iii. Interaction between teachers and students
      1. The interaction between teacher and I is adequate during online learning activities.
      2. I know how to seek teachers' help during online learning activities.
    - iv. Interaction among students
      1. I was able to interact with my classmates during online learning activities.
      2. It was easy to interact with my classmates during online learning activities.
    - v. Feedback from the interface
      1. I was able to receive feedback from the learning platform(s) during online learning activities.
      2. The feedback received from the learning platform(s) is easy to find during online learning activities.
    - c) Transfer Phase
      - i. Application of Skills and Knowledge
        1. I can apply the skills and knowledge learnt from online learning activities in daily life.
        2. It is easy to apply the skills and knowledge learnt from online learning activities on other subjects.
      - ii. Meaning of Learning
        1. Learning online broadens my horizon.
        2. Learning online motivates me to learn more.
- E) Ways to improve online learning effectiveness
- Please rate the following measures from 1 (least effective) to 5 (most effective).
1. Provide the outline and content of each session.
  2. Provide a suggested time for each homework.
  3. Provide a timer and reminder message on the online learning platform.
  4. Provide a bar showing learning progress.
  5. Reduce the distraction of the online learning platform.
  6. Provide compulsory break during online learning.
  7. Encourage discussion on online learning platform.
  8. Provide extra video with clear step for review and facilitation of homework.
  9. Provide quiz after class with immediate feedback and answer.
  10. Provide worksheet after each class to consolidate the basic knowledge of the class.

11. Provide vocabulary sheet before class for revision.
12. Provide multimedia information to facilitate learning.
13. Encourage the use of online dictionary.
14. Provide audiobooks and word-to-text function.
15. Provide synonym list for revision.
16. Encourage the use of mind map.

F) Demographics

1. What type of children with SEN do you teach this year? (Specific Learning Difficulties/ Intellectual Disability/Autism Spectrum Disorders/ Attention Deficit / Hyperactivity Disorder /Physical Disability/ Visual Impairment/ Hearing Impairment/ Speech and Language Impairments / Mental Illness)
2. Which grade did you teach? (Primary 1/ Primary 2/ Primary 3/ Primary 4/ Primary 5/ Primary 6)
3. You are (Special Educational Needs Coordinator (SENCO)/ Special Educational Needs Teacher (SENT)/ Teachers/ Other: \_\_\_\_\_)
4. How long have you been practicing as teacher?
5. Which subjects are you currently teaching? (Chinese/ English/ Maths/ General Studies/ Visual Arts/ Music/ Physical Education/ Putonghua)
6. Please indicate your education level: (Diploma/ Bachelor/ Master or above)
7. Please indicate your training or professional development related to special educational needs. (Basic course/ advance course/ thematic course)
8. Your sex. (Male/ Female)

Note. Teachers rate five times for items in section C and D (one for typically developing students, one for students with attention deficit/hyperactive disorder, one for students with autism spectrum disorder, one for students with special learning difficulties and one for students with speech and language impairment)

Appendix 3. Semi-structured interview questions for teachers, caregivers and students.

1. What do your child enjoy most about online learning?
2. What do your child feel difficult about online learning?
3. What are the ways you and your child do to overcome the difficulties?
4. Will you spend more time on learning when it is conducted online?
5. Is your child prepared for online learning (in terms of (a) learning ability, (b) learning skills)?
6. What are the difficulties/facilitators to prepare the child for online learning in home environment?
7. What are the difficulties of using the online learning tools?
8. Are there any difficulties/facilitators for implementing online learning at home?
9. Does your child have enough time to complete online learning?
10. Are there any difficulties for your children to understand the content of online learning?
11. What are the difficulties/facilitators to facilitate the child's engagement?
12. What are the difficulties/facilitators for the child to understand the materials of online learning?
13. What are the difficulties/facilitators for the child to communicate with teachers?
14. How online learning affects the relationship between teachers and your child?
15. What are the difficulties/facilitators for the child to express his/her ideas?
16. What are the difficulties/facilitators for the child to interact with others? Or to facilitate peer learning?
17. How online learning affects your child's peer relationship?
18. Is there any features of the online learning materials facilitate or hinder your child's learning?
19. What are the difficulties/facilitators for children to apply what they learnt during online learning?
20. Did your child's learning habit change after online learning?  
(Below questions for teachers only)
21. Any resource that are needed for online learning?
22. Any recommendations to school to support teachers in providing online teaching?
23. Please describe the difficulties and support methods to a) students with attention deficit/hyperactive disorder, b) students with autism spectrum disorder, c) students with special learning difficulties and d) students with speech and language impairment.

Note. The word "my children" is interchangeable with "you" and "your students" depending on the teachers', caregivers and students' version.