

Inequality Issues in Online learning of Chinese Cross-border Students under the COVID-19 Pandemic: A Longitudinal Study at a Macro-level

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ABSTRACT: Due to the varied social inequalities, the pandemic has prompted unprecedented attention to the social divides in learning gains via online/blended learning. It has been identified that approximately 27,000 Chinese cross-border students live on the Mainland but attend Hong Kong schools every day. The pandemic has restricted the passage of the Shenzhen-Hong Kong border, and these students suffer greatly as they may still be forced to attend online lessons at home for over two years, even if schools return to face-to-face teaching. This study is a 2-year longitudinal case study with a purposeful sampling of a primary school that has over 70% of Chinese cross-border students. A mixed-methods approach was adopted to examine students' online learning experiences via teachers' interviews. Regarding their learning challenges, 35 students were invited to complete a 5-point Online Self-regulated Learning Questionnaire (OSLQ) and an open-ended opinion survey, which was then triangulated with teachers' feedback. First, this study has identified three major challenges that cross-border students suffer the most in online learning: self-regulation strategies, technical challenges, and social interaction. Second, several teaching strategies have been found to offer additional support (e.g., after-school classes and learning centers in Shenzhen) for cross-border students to sustain their online learning and alleviate their learning challenges. Based on these findings, this study contributes to documenting the learning challenges for cross-border students during the pandemic, which provides insights for other schools to facilitate cross-border education and develop appropriate online learning strategies for cross-border students.

Keywords: Cross-border students, Online learning, Pandemic, Social divide

1. Introduction

Due to the COVID-19 pandemic, approximately 1.6 million learners across more than 200 countries have been significantly impacted by the shift from face-to-face to online learning modes (Pokhrel & Chhetri, 2021; Ng et al., 2020). After two years of extended online learning, the digital divide in society has widened, primarily due to varied social inequalities. For instance, Mathrani et al. (2021) reported that some developing countries (e.g., India, Pakistan, and Bangladesh) have experienced exacerbated digital inequality because the quality of online learning relies heavily on students' technological abilities and digital devices. Recent research has revealed how millions of children's educational trajectories have been disrupted and damaged during the pandemic due to social inequality (e.g., Bacher-Hicks et al., 2021; Jæger & Blaabæk, 2020). Such inequality results in unequal learning gains due to government policies, school background, teacher qualifications and experience, students' learning resources, and technologies. Additionally, other factors such as special educational needs, socioeconomic status, self-regulated learning skills, family support, and learning environments also significantly impact students' learning outcomes (Blundell et al., 2020).

During the pandemic, children from low-income families are at greater risk of exclusion from online learning due to insufficient internet or digital devices. Students in rural areas may also face poor internet connections, which can negatively impact their online learning. These issues have been widely discussed in educational studies. However, among these factors, the phenomenon of cross-border learning has been identified but has yet to be explored in academic literature. Cross-border student issues are common across the globe, such as Singapore-Malaysia and USA-Mexico cross-border students who live in their own countries and receive education in neighboring countries (Orraca et al., 2017; Yuen & Cheung, 2014). In Hong Kong, around 27,000 Chinese cross-border students live on the Mainland but attend Hong Kong schools every day (Legislative Council, 2021). However, the pandemic has restricted the passage of the Shenzhen-Hong Kong border, and these students are greatly affected as they may still be forced to attend online lessons at home for over two years, even if schools return to face-to-face teaching. This situation has arisen due to the Hong Kong government's 2011 policy allowing doubly non-permanent resident pregnant women to give birth in Hong Kong (Chan, 2018). These cross-border students are Hong Kong permanent residents, but their parents are Mainland residents who live in the Mainland. Therefore, these students crossed the Shenzhen-Hong Kong border every day before the COVID-19 pandemic. This issue highlights the need for further research on the challenges faced by cross-border

students during the pandemic, as well as the development of appropriate online learning strategies to support their education.

Due to the pandemic, Chinese cross-border students were unable to return to their schools for nearly two years (Legislative Council, 2021). The Hong Kong government and schools have developed innovative ways to help these students interact with their classmates, such as setting up learning centers on the Mainland or supporting their learning at home through online platforms. However, these policies cannot be consistently implemented as they depend on the pandemic situation. When the Education Bureau (EDB) announced a whole-school resumption of half-day from May 2021 to January 2022, with the pandemic under control, cross-border students still had to adhere to travel restrictions between Mainland China and Hong Kong. As per the rules, students could only stay on the Mainland to sustain online learning. Without teachers' face-to-face support, students had to independently carry out learning activities in online lessons and self-paced learning tasks, which relied heavily on their motivation and self-regulation. As a result, Chinese cross-border students faced numerous challenges related to online learning during the pandemic, such as social interaction, self-regulation, teachers' teaching strategies, government and school policies, and parental support. It is essential to address these challenges to ensure that cross-border students receive a quality education and support their academic development. Further research is needed to identify effective strategies to address the challenges faced by these students and develop appropriate policies to facilitate cross-border education.

Numerous studies have focused on online learning during the COVID-19 pandemic, reporting on the challenges of learning and teaching caused by remote learning (Adedoyin & Soykan, 2020; Carrillo & Flores, 2020; Rasheed et al., 2020). However, there is a lack of research on online learning experiences at the process level, such as social interaction, for both students and teachers (Rasheed et al., 2020). Therefore, it is crucial to study online learning using a longitudinal approach to analyze the process level, such as the meso-level with measures taken over several months. To address these gaps, this article aims to investigate the longitudinal approach of learning perceptions of Chinese cross-border students at the macro-level (two-year online learning). The study aims to uncover how cross-border students and their teachers perceive their online learning experiences over two years during the pandemic. Furthermore, this study also analyzes the educational policies for cross-border students implemented by the Hong Kong government and schools. By providing a holistic picture, we can understand how cross-border students, their teachers, the Hong Kong government, and schools experience different online learning challenges during COVID-19. The following research questions are identified:

- What are the major challenges that cross-border students perceive in their online learning?
- What strategies have been used to handle cross-border students' online learning challenges, and how have these strategies been employed?

2. Literature review

2.1. The context of Chinese cross-border students in Hong Kong

Influenced by globalization, some developed countries/regions with a well-known reputation in the education domain have attracted students from other countries (Knight, 2005). Many students aspire to pursue their education in these countries/regions (Knight, 2005). In such scenarios, cross-border/boundary students live in their home country but need to cross the border to study in other countries/regions (Chan et al., 2020). For instance, owing to the similar cultural heritage and high education quality in Singapore, most Malaysian families believe that Singapore offers an international perspective and provides more future education opportunities for their children (Yuen & Cheung, 2014). Consequently, many Malaysian students cross the border to attend schools in Singapore. In another comparable case, Mexican students cross the boundary to study in the USA because the educational quality of the USA is superior to that of Mexico (Orraca et al., 2017). The Mexico-USA cross-border students undergo a similar experience to most cross-border students in other countries, such as adapting to different languages and cultures in two countries/regions (Piedra & Araujo, 2012).

Among Asian countries/regions, there is a unique scenario between Shenzhen (a city in Mainland China) and Hong Kong, where thousands of students are in line to cross the border every day (Chan et al., 2020; Chan, 2018). These students (approximately 25,000) were born in Hong Kong but live in Shenzhen because their parents are non-permanent residents of Hong Kong. This phenomenon arose due to a policy implemented in 2011 that allowed Mainland pregnant women (doubly non-permanent resident pregnant women) to give birth in Hong Kong (Chan, 2018). At the end of 2012, the Hong Kong government announced the "zero doubly non-permanent resident quota" policy, which significantly reduced the number of cross-border students after that year (Policy Address, 2013). Despite this, these students face difficulties when seeking enrollment in Mainland

schools because they are permanent residents of Hong Kong rather than Mainland citizens (Chan et al., 2020). If cross-border students prefer to study on the Mainland, they need to attend international or Hong Kong children's schools with high tuition fees, which most families cannot afford. Therefore, these Mainland parents send their children to Hong Kong local schools, from kindergarten to secondary school (Leung & Waters, 2022). One of the influencing factors is that Hong Kong education has an excellent global reputation and provides more international opportunities for children to advance their development. Therefore, most Mainland parents believe that Hong Kong's education is superior to that of the Mainland.

2.2. Online learning situation for cross-border students

During the pandemic, the government expressed concerns about the online learning situations for cross-border students in Hong Kong. According to a government document, there were approximately 27,000 students (as of October 2020) who lived in Mainland China but had to cross the border every day to receive K-12 education in Hong Kong before the COVID-19 pandemic (Legislative Council, 2021). However, the pandemic disrupted their learning when various social isolation policies were announced. These cross-border students could not attend physical lessons in Hong Kong, even though schools started half-day face-to-face learning after May 24, 2020 (Legislative Council, 2021). The document listed six dimensions of support measures to facilitate cross-border students' online learning: (1) supporting cross-border students to learn online at home, (2) addressing students' emotional needs, (3) flexible assessment that facilitates cross-border students' learning progress, (4) arrangements for primary one and secondary one cross-border students' admission, (5) offering additional learning courses and services for cross-border students at temporary centers in Shenzhen, and (6) other supports for the renewal of home return permits (Legislative Council, 2021). For example, the Hong Kong government has arranged two temporary learning courses in Shenzhen (Legislative Council, 2021). One is the "Psychosocial Support Course" in the Futian district, and the other is the "Learning Support Course" in the Nanshan district. The two entrusted agencies provide additional services for cross-border students and their parents, including practical information, learning materials, emotional support materials, free borrowing of books, recreational supplies and facilities, and arranging social activities such as networking events and sharing sessions to facilitate their social interaction (Legislative Council, 2021). These measures provide cross-border students with additional resources to facilitate their distance learning via face-to-face group teaching and social activities to meet their cognitive and social needs.

According to the report, parents of cross-border students understood that their children would unavoidably lag behind, compared to other local students, in terms of learning progress and academic performance (International Social Service, 2020). The report showed that over 50% of the families of 3,000 cross-border students worried about their online learning situation due to class suspension arrangements. Several reasons were proposed. First, cross-border students could not participate in face-to-face lessons due to the border closure between Hong Kong and the Mainland during the pandemic. Moreover, they could hardly use some e-learning platforms in the Mainland due to internet censorship (which is not specific to the pandemic), and many domain names are controlled or blocked. These include some popular websites for learning purposes, such as Google Suites, YouTube, and Wikipedia, which cause a disjuncture between the two digital spaces across the Hong Kong-Mainland border (Leung & Waters, 2022). Furthermore, 64% of the parents were concerned about discrimination their children might face when they eventually returned to school. They hoped that schools should minimize the negative impact caused by the pandemic, provide enough time for their children to prepare for class resumption, and offer additional online learning support (International Social Service, 2020).

The learning challenge faced by cross-border students during online learning has captured the interest of scholars. Two recent research papers have discussed various learning difficulties and inequalities among cross-border students. The pandemic has exacerbated digital inequality between local and cross-border students (Chan et al., 2020; Leung & Waters, 2022). The studies have identified challenges such as accessing learning materials, stress among cross-border students and their parents, sense of belonging, and online schooling experiences (Chan et al., 2020; Leung & Waters, 2022). These challenges demonstrate that cross-border students face various learning difficulties compared to local students and offer a rationale for this study.

2.3. Challenges of learning and teaching in online learning during the COVID-19 pandemic

The transition from face-to-face to online learning has posed direct and deep challenges for students. Many prior studies have concluded multiple challenges of online learning (e.g., Adedoyin & Soykan, 2020; Rasheed et al., 2020). For example, Adedoyin and Soykan (2020) mentioned seven challenges in online learning during the COVID-19 pandemic, including technology, socio-economic factors, digital competence, assessment, and

supervision. Particularly, the quality of technology is essential and compulsory for students' online learning. Also, students' digital competence is directly related to problem-solving skills, information management, and collaboration with effectiveness and efficiency (Ferrari, 2012). Students with low digital competence struggle in online learning, which is not good for academic performance. In another research study, Rasheed et al. (2020) reported that students' challenges in online learning included self-regulation, technological literacy and competency, students' isolation, technological sufficiency, and technological complexity challenges. The most severe challenge was discovered to be self-regulation, which reflects students' procrastination behavior (AlJarrah et al., 2018) due to the flexibility and autonomy offered by online learning. Thus, online learning requires students to have more self-control to cover the disadvantages of independent learning and fewer online interaction characteristics to avoid procrastination (Hong et al., 2021). Another influencing factor is the online help-seeking challenge. Broadbent (2017) mentioned that students could not get suitable help when not face-to-face. Er et al. (2015) also suggested that students were challenged in their technological skills when seeking help in online learning. These factors will directly influence students' self-regulated learning because they will be unable to operate the online learning system using the correct technological skills. Other factors influencing students' self-regulation challenges are a lack of self-regulation skills (Chuang et al., 2018), limited preparation before class (Broadbent, 2017), poor time management skills (Akçayır & Akçayır, 2018), and improper utilization of online peer learning strategies (Cakiroglu & Ozturk, 2017).

Apart from students' learning challenges, there are also teaching challenges faced by educators, who play the most important role in online teaching during the COVID-19 pandemic. Several studies have analyzed the challenges of teachers' teaching during the pandemic period (Rasheed et al., 2020; Carrillo & Flores, 2020). For example, Rasheed et al. (2020) conducted a systematic review of challenges in online learning, pointing out a set of challenges for teachers during online teaching, including teachers' technological literacy and competency, online video, technological operations, and teachers' beliefs. Among these challenges, the major ones are teachers' technological literacy and competency. Rasheed et al. (2020) mentioned several reasons for this, such as a lack of experience with using the online platform for creative instruction (Cheng & Chau, 2016), a lack of confidence and time to learn technology applications (Brown, 2016), and a lack of technological competence (Boelens et al., 2017). Another example is Carrillo and Flores (2020), who conducted a literature review on teacher education in online learning under COVID-19. They mentioned teachers' limited competence in using digital instructional formation (Huber & Helm, 2020) and insufficient experience in online teaching. Thus, it is essential to promote professional training to enhance teachers' technological literacy and competence. Otherwise, online learning may cause more and more disadvantages for teachers and students, such as ineffective teaching outcomes and low learning efficiency.

2.4. Self-regulated learning

This study used a questionnaire adopted from the Online Self-Regulated Learning Questionnaire to measure learners' self-regulation, which is widely used in secondary schools across various disciplines (e.g., Alten et al., 2021; Lau, 2021; Zalli et al., 2020). This questionnaire was developed based on the 14 self-regulation theories proposed by Zimmerman and Schunk (2011), which include three important stages: forethought and planning, performance control, and self-reflection (Zimmerman, 2000). The first stage requires students to analyze the learning task, set goals for positive actions, seek more information and resources for the specific task content, and establish a suitable environment for studying. The second stage involves note-taking, organizing and memorizing facts/knowledge, seeking assistance and learning support, and managing time well. The final stage focuses on students' reflection during and after completing their learning tasks so that they can evaluate their performance, learning strategies, and outcomes according to the goals set (Fung et al., 2018).

The questionnaire used in this study consists of 24 items with six dimensions of self-regulated learning, including goal-setting, environmental structuring, task strategies, time management, help-seeking, and self-evaluation, developed by Lau (2021). The validity and reliability of this questionnaire were reported to be good among 417 Hong Kong students (Grades 4-9, aged 9-15), and researchers were recommended to use it across different learning settings. In our study, the school context, such as location and cultural background, is also in Hong Kong, and our student participants are from grade 5 with an age of 10. Hence, the questionnaire is suitable for this study to examine online self-regulation behaviors among cross-border students.

The six aspects of the questionnaire are explained as follows:

- Self-regulated learning (SRL) involves students' efforts to manage their learning processes oriented towards achieving goals (Zimmerman & Schunk, 2011).
- Goal-setting involves students' development of an action plan to motivate and guide them towards a goal (e.g., staying attentive during the online class, achieving good performance on the exam) (Cho & Shen,

2013; Latham & Locke, 1991). It helps students commit their thoughts, emotions, and behavior towards attaining the goal.

- Environmental structuring examines how the online learning environment can be rearranged to avoid learning distractions and enhance students' motivation and achievement (Yen et al., 2016).
- Task strategies refer to the positive behaviors students develop using various strategies to overcome their online learning challenges (e.g., collaboration, note-taking, reading aloud, using technologies to facilitate learning) (Barnard-Brak et al., 2010).
- Time management consists of scheduling and distributing students' time for learning (Yen et al., 2016).
- Help-seeking allows students to find teachers, classmates, and parents for help, whereas self-evaluation encourages them to summarize and evaluate their learning progress in online courses to examine their understanding (Whipp & Chiarelli, 2004).

3. Methods

3.1. Participants

This article outlines the research design of a longitudinal study in Hong Kong aimed at describing the impact of cross-border learning on cross-border students. This study utilized mixed methods to collect data through open-ended surveys and questionnaire responses from 35 primary five cross-border students (17 boys and 18 girls) and semi-structured interviews of their teachers ($n = 3$). Purposeful sampling was used to identify a primary school that was reported to have 70% (around 140) of its students residing in the Mainland but studying in Hong Kong. In other words, all participating students were cross-border students who claimed that the pandemic had restricted their travel across the border, and attending online lessons was their only option. Primary five students were chosen because they undergo a significant transition from primary four to five. They need to participate in internal assessments for secondary school place allocation, which can cause great examination pressure on most primary students (Berry, 2011).

The researchers collaborated with three teachers from the school who were responsible for the online teaching transition for over two years. These teachers voluntarily agreed to participate in individual interviews to provide a comprehensive picture of the cross-border students' online teaching experience and how they overcame any teaching challenges. Based on their observations, the researchers conducted interviews with the teachers to understand cross-border students' learning experiences, challenges, and other learning challenges they faced during the pandemic. Table 1 displays the demographic information of the teacher interviewees.

Table 1. Demographic information of the teacher interviewees

Name (fictitious)	Gender	Teaching subject	Years of teaching	Job title(s)
Chan	Male	Mathematics	8	Curriculum Coordinator and IT Officer
Chu	Female	English	4	Headteacher
Wong	Female	Chinese	7	Chairman of the Chinese Division

3.2. Data collection and analysis

This study examined students' self-regulation of online learning within two periods (from Jan 2020 to July 2020 and Sep 2021 to Jan 2022). To analyze the learning challenges for cross-border students, the study revealed how students perceived their online learning challenges through an opinion survey, followed by a questionnaire. Qualitative questions (e.g., What challenges do you encounter when learning online?; Do you employ private tutors to support your learning?; How do your parents, schools, and community centers support your learning?) were asked to identify major learning issues students faced. Students then self-reported in the survey what challenges they encountered when learning online. The first and second authors worked together to categorize students' feedback into various key challenges, including lacking self-regulation, poor academic performance, lacking parental support, being distracted, meeting technical challenges, lacking electronic equipment and internet network, and lacking social interaction and communication. To ensure reliability, students' feedback was coded according to the identified challenges (see Table 2). The inter-rater reliability between the researchers was found to be good, with a Cohen's kappa coefficient of 0.77 (Watkins & Pacheco, 2000).

According to the survey, self-regulation was found to be the most significant challenge. This was further examined based on students' questionnaire responses to understand their perceived ability and its six related behaviors. The Chinese version of the Online Self-Regulated Learning Questionnaire (OLSQ) was adopted and

evaluated by previous research (Fung et al., 2018). The OLSQ comprises 24 items with a 5-point Likert scale, examining six aspects of online learning: goal setting, environmental structuring, task strategies, time management, help-seeking, and self-evaluation.

To triangulate the quantitative results, qualitative data was collected to provide a fuller picture of their online learning affecting their academic outcomes and social life via students’ and teachers’ interviews. Throughout the interviews, students’ online learning challenges and teaching strategies were documented via interviews to understand what types of support teachers and the school offered to facilitate cross-border students’ online learning according to the two research questions. A set of interview protocols was used to facilitate researchers to categorize into themes that would greatly impact cross-border education. After conducting the interviews, their recordings and reflection were transcribed and coded. Inductive thematic analysis was adopted and grouped patterns of similar meanings into two themes based on the research questions: cross-border students’ online learning challenges and strategies to facilitate cross-border students’ online learning for cross-border students’ online learning.

Likewise, the two researchers then further coded and analyzed the dialogues according to the themes to ensure reliability (see Table 2). To establish coding reliability, all of the dialogues were analyzed by the two researchers. Disagreements were settled through discussion. Cohen’s kappa coefficient (0.86) was found to be good to show inter-rater reliability between the researchers (Watkins & Pacheco, 2000). With qualitative and quantitative methods and elements, this study can triangulate and combine results into a comprehensive picture of cross-border education.

Table 2. Coding scheme of research questions

Topics	Themes	Definitions/ Descriptions	Sample sentences
RQ1. Cross-border students’ online learning challenges	Self-regulated learning	Students’ efforts to manage their learning processes are oriented to achieving goals (Zimmerman & Schunk, 2011).	“Students have no big improvement in self-regulated learning. We can see that self-regulation is really a challenge for cross-border students...”
	Technical challenges	Students might not have enough technical equipment and Internet access at home.	“Some students don’t have enough digital devices...” “One of the most serious problems is technical difficulties...”
	Social interaction	The opportunities for students to interact, communicate, and collaborate with classmates and teachers.	“There is a lack of interaction with the teachers and local students in Hong Kong.”
RQ2. Strategies to facilitate cross-border students’ online learning	Cognitive support	Support that enables students to construct knowledge in an online learning environment (Garrison, 2007).	“We used Kahoot (a gamified platform), Seesaw (a digital mind map platform), and Pallet (a social media and collaborative tool).”
	Social support	Support that enables students to socialize with others through online learning activities (Garrison, 2007).	“We tried hard to make students socialize by using the functions in Zoom, such as group discussion, voting, drawing, and other interactive functions.”

4. Results and discussion

4.1. RQ1. What are the major challenges that cross-border students perceive in their online learning?

Opinion surveys have identified three major challenges (i.e., self-regulation, technical challenges, and social interaction). Among the 35 cross-border students, 15 (42.9%) claimed they were not satisfied with the online learning experience compared to the face-to-face classes they attended before the pandemic. Most of them declared that they lacked self-regulation due to an inactive online learning atmosphere ($n = 22$, 62.9%), negatively impacting their academic performance ($n = 16$, 45.7%). One reason students suggested is that they

could easily be distracted during online learning at home ($n = 17, 48.6\%$), especially without much parental support ($n = 16, 45.7\%$). Furthermore, students encountered various technical difficulties, such as a lack of electronic equipment and internet network ($n = 16, 45.7\%$) and low social interaction and communication with their teachers/classmates ($n = 15, 42.9\%$).

To examine how prolonged online learning would affect students' self-regulation, this study administered the QLSQ to understand students' perceived ability and the six aspects of self-regulation behavior (goal setting, environmental structuring, task strategies, time management, help-seeking, self-evaluation) ($p > .05$). Although other local students also faced the three online learning challenges, cross-border students had no face-to-face learning opportunities throughout the two years, which exacerbated the negative impact of online learning. The results indicated no significant learning improvement in the pre-test and post-test for all items (see Table 3). In other words, cross-border students' improvement is not significant even though the teachers have worked very hard to support cross-border students' online learning. These results aligned with the above-mentioned opinion survey results and were triangulated with the support of qualitative dialogues.

Table 3. Self-regulation and perceived abilities of cross-border students in their pre and post-tests

	Mean (T1)	SD (T1)	Mean (T2)	SD (T2)	Sig. level (SE)
Goal setting	3.55	0.89	3.59	0.92	0.87 (0.21)
Environmental structuring	3.71	1.01	4.00	0.90	0.16 (0.20)
Task strategies	3.44	1.10	3.80	1.02	0.16 (0.25)
Time management	3.37	1.02	3.70	1.07	0.19 (0.24)
Help-seeking	3.29	1.01	3.47	1.01	0.13 (0.23)
Self-evaluation	3.38	0.99	3.74	0.96	0.30 (0.22)
Perceived ability	3.43	1.08	3.66	0.84	0.44 (0.23)

4.1.1. Self-regulation strategies

Over two years of online teaching, cross-border students unavoidably fell behind in their learning progress compared to other students. One possible reason is that social isolation policies prevented cross-border students from returning to schools, even when all schools in Hong Kong resumed half-day face-to-face teaching from May 2021 to January 2022. As a result, cross-border students could only continue studying online at home without any physical lessons, while other local students could still receive face-to-face or blended lessons at school. The opinion survey revealed that the biggest challenge perceived by cross-border students was a lack of self-regulation skills.

A teacher believed the situation was understandable, "Students have no big improvement in self-regulated learning. We can see that self-regulation is a challenge for cross-border students. The results do not surprise us. We cannot expect students to have great improvements." Then, the authors interviewed teachers to identify why students were not self-regulated. A teacher mentioned that this was associated with parental support, "Not all students have their parents to guide them to learn at home. It is not easy for young children to attend web-conferencing lessons and study self-paced materials alone. They easily get distracted and do other interesting things while having lessons. Those students who have their parents tutoring them will have better academic achievements. However, most parents have full-time jobs, so online learning relies on students' self-regulated learning." Another teacher expressed sympathy for the cross-border students since the pandemic created an unequal educational opportunity. The teachers had difficulty narrowing the inevitable and unfair gap, "We have never physically met the students. Supporting them in a solely online environment for two years is not easy. We have done our best to improve our teaching quality, but we cannot force our students to stay attentive (and self-regulated) during the online lessons." All these conversations provided evidence from teachers' perspectives that students tended to have weak self-regulation skills to stay motivated and engaged in online learning.

Effective SRL strategies are critical in online learning, given the high degree of student autonomy from the instructor's physical absence (Barak, 2022). Students with greater SRL abilities tend to have a better goal orientation, academic self-efficacy, and regulations in the learning contexts, making them have higher learning abilities (Cho & Shen, 2013). Furthermore, students with SRL skills have positive learning behaviors such as supporting peer work, recommending their notes, helping each other, and displaying a high level of assessment (Wong et al., 2019). As such, teachers need to develop cross-border students' self-regulation strategies, such as asking students to consider how they learn online, providing pacing support, monitoring engagement, and supporting families (Carter Jr et al., 2020).

4.1.2. Technical challenges

Some cross-border students have reported a lack of necessary technical equipment and internet access at home. While local students could borrow equipment and receive roaming data passes from their schools, the school hardly supported cross-border students in this regard, as it was impossible to deliver equipment to their homes on the Mainland. For instance, some students reported not having tablet devices to facilitate their learning, and their network connection was unsatisfactory. Mr. Chan commented, “Some students do not have enough digital devices. They can only use WeChat or Zoom to facilitate their online learning via mobile phones. For those who do not have digital devices at home, it is impossible to deliver computers or laptops. Local students could easily borrow equipment, but cross-border students could not get these devices. We can seek support from the community center on the Mainland.”

Even students with sufficient digital equipment have reported that the school’s solely online technical support could hardly solve their problems. Mr. Chan, a teacher, explained, “One of the most significant problems is technical difficulties... When they need technical support, it is hard to support them online. We can only rely on their parents to guide them on using e-learning tools at home so they can continue with online learning smoothly. However, not all parents are technologically literate enough to offer timely support.” Other studies have also found that distance learners may face more technical challenges than local online learners, such as a lack of digital equipment, slow internet speeds, and difficulty setting up learning platforms (Yan et al., 2021). Local students could still return to school and gain support, but distance learners such as cross-border students can only resolve their problems online.

Due to internet censorship in the Mainland, as discussed in the literature review, many domain names are controlled, making it difficult for cross-border students to access educational websites and applications (Leung & Waters, 2022). This affects the quality, motivation, and overall experience of their online learning. Students have reported that some websites, even those for educational purposes, are prohibited on the Mainland, making it challenging to access online materials set by their teachers. Mr. Chan commented, “We need to consider if cross-border students can access websites at home. Some websites are blocked on the Mainland... Sometimes, students report to us that they cannot access learning materials. In such cases, we need to send them through alternative ways like email or WeChat.”

4.1.3. Social interaction

The third challenge faced by students is the difficulty in interacting and socializing with their classmates through online learning activities (Richardson et al., 2017). This is unavoidable as cross-border students can only participate in online learning even when schools have resumed face-to-face classes. Social support could provide learning opportunities for students to co-construct knowledge through varied pedagogies such as collaborative project-based learning and discussion. However, cross-border students could only interact with classmates online. A student shared their evaluations of social support, “I cannot learn much and can’t meet new friends in my school. There is a lack of interaction between teachers and local students in Hong Kong. They virtually appear there.” A teacher also pointed out that some activities are better conducted face-to-face (e.g., music, sports, and arts), which require many social interactions. Cross-border students could only watch video demonstrations or participate in Zoom sessions, and not all activities can be transformed online due to their hands-on nature.” Although the school tried to implement some practices to improve students’ learning experiences, it still did not work due to the pandemic. Another teacher stated, “We thought about arranging institutions in Shenzhen to organize group classes and other extracurricular activities, but we did not implement them eventually because the pandemic became severe.” This is consistent with previous findings that social isolation strongly impacts young students (Zhang et al., 2020). Therefore, due to the pandemic, online learning interaction plays a vital role in managing students’ stress due to social isolation.

4.2. RQ2. What strategies have been used to handle cross-border students’ online learning challenges, and how have these strategies been employed?

In the previous section, this study highlighted that cross-border students faced additional challenges (such as a purely online learning environment, lack of socialization, and restricted access to learning resources due to geographical limitations) that local students did not encounter during their online learning. Inspired by Garrison’s (2007) *Communities of Inquiry in Online Learning*, teaching strategies could include curriculum planning, material preparation, teaching and learning to construct students’ knowledge and enhance their

socialization. This section aims to evaluate the teaching strategies designed to alleviate cross-border online learning challenges in terms of cognitive and social support.

Proper cognitive support can provide students with a better learning experience than delivering content through presentation support tools (Bernard et al., 2014). To support cross-border students' academic performance, teachers have employed various strategies, such as using social media, collaborative tools, recorded videos, mind maps, and gamification, to enhance students' engagement and motivation. One teacher reflected on her teaching, "We used Kahoot (a gamified platform), Seesaw (a digital mind map platform), and Pallet (a social media and collaborative tool). We also tried various web-conferencing platforms like Teams and Zoom to facilitate synchronous learning. We want to make the lessons more engaging and interesting." To address the issue of unequal learning opportunities and provide diversified digital learning resources and pedagogies, teachers provided students with supplementary learning activities. A teacher mentioned, "You cannot imagine how young children 'go to school' purely online for two years. They lack self-regulation and learning autonomy, which has worsened their academic performance. Online learning requires great effort to stay motivated, attentive, and self-directed. It is hard for young children, especially when their parents have little time to accompany them. No matter how many make-up classes we offer, if they do not take the initiative in their learning, they do not have a good learning performance."

However, despite the cognitive support measures such as additional lessons and digital tools given to students, they still struggled to stay engaged and motivated. A teacher attributed this to the lack of parental support. "Most parents need to work, so cross-border students have no one to take care of them. We called their parents to gain their support (e.g., employing private tutors). We hope the pandemic will be over soon, and the government will relax the policy to allow cross-border students to travel and study here." Overall, it is evident that cross-border students were not satisfied with the online learning experience, even though teachers worked hard to enhance their academic achievement through cognitive support. Therefore, teachers sought support from parents to further alleviate the challenges faced by cross-border students.

Social support is crucial for students to gain knowledge and socialize with classmates through well-designed online learning activities (Richardson et al., 2017). It provides many opportunities in an online learning environment, such as enhancing student motivation and participation, actual and perceived abilities, learning satisfaction, and retention in schooling (Ng, 2022a; Ng, 2022b). Two teachers provided feedback, "We tried hard to make students socialize by using the functions in Zoom, such as group discussions, voting, drawing, and other interactive functions." "Some introverted students seem to have greater socialization opportunities. Compared to face-to-face teaching, they actively participate in our e-learning activities and online courses. They seldom speak during classes because they are unfamiliar with the local language. With online communication tools (e.g., social media, instant messaging software), they can type and interact using online tools that help them communicate." These measures can facilitate students' interaction, socialization, and collaboration to maintain learning and assessment with peers in an online environment. Social support is echoed among students and teachers as their feedback and contributions during lessons are social capital as resources that empower online learners (McIntyre, 2021).

Although teachers have employed strategies similar to those used for other local students, cross-border students believed that these strategies were not very useful for their learning. Some students employed private tutoring ($n = 18$, 51.4%), but other cross-border students did not have many resources for private tutoring. Some claimed they were not equipped with enough technological resources ($n = 16$, 45.7%) and did not have the knowledge/skills to use IT for online learning ($n = 6$). The saying "fair is not always equal" applies here. To reduce the cross-border students' learning gap, additional resources, including strategies to promote self-regulated learning, technological resources, and cognitive and social support, should be offered to facilitate cross-border students' learning. However, due to geographical restrictions, they may never be able to obtain the same learning experiences as local students.

5. Conclusion

The pandemic has brought unprecedented attention to educational inequality and challenges through online/blended learning (Ng et al., 2020). Researchers have conducted numerous studies to document snapshot studies and the major types of social inequalities for various reasons (such as special education needs, socioeconomic status) (Chan et al., 2020; Leung & Waters, 2022). Cross-border education is rarely discussed in prior studies, but it is a critical issue that educators should be aware of. Due to prolonged online teaching, cross-border students in Hong Kong suffered more in terms of academic performance and socialization due to travel

restrictions. They were forced to participate in purely online learning for over two years. While other local students in Hong Kong could engage in face-to-face teaching, club activities, community service, and competitions, cross-border students could only participate in these activities purely online. Overall, cross-border students could not enjoy an equal opportunity to learn cognitively and socially compared to their counterparts.

To gain an understanding of cross-border education, the research team worked with three teachers and empathized with their stress and helplessness for two years. Strategies were applied to facilitate learning, including government, school, and teacher support (such as setting up community centers on the Mainland and using web-conferencing software/social media to communicate). Although their school devised creative solutions to help cross-border students overcome their online learning challenges, most students claimed that teacher support was insufficient. Cross-border students still face various difficulties, such as a lack of technological resources, motivation, and self-regulation. According to interviews and questionnaires, two concerns were raised by most students, self-regulation and social interaction, and they attributed their failure to low perceived ability. Firstly, solely online learning relied heavily on students' motivation and self-regulation. Without teacher or parent supervision, engaging cross-border students in the online learning environment was not easy. Secondly, the school was not only a learning location for students to acquire knowledge and skills but also a community for students to socialize and enjoy campus life.

Furthermore, dropout rates and prolonged online learning have increased teachers' stress and worry. They claimed that they felt exhausted from making contingency plans for both cross-border and local students. When students applied to transfer schools, their school would have the risk of getting suspended due to an inadequate student-teacher ratio. Despite the difficulties perceived by teachers and students during the pandemic, they improved their technical skills to communicate, learn, and collaborate in an online environment. In our study, the qualitative measurement allowed cross-border students' and their teachers' voices to be showcased and enabled us to explore how other countries perceive similar issues in facilitating cross-border education.

6. Research limitations and recommendations for future research

Several limitations were identified in this study. Firstly, only one primary school was selected, which may not provide enough information to generalize the overall picture of the cross-border students' situation in Hong Kong. Secondly, the limited number of teacher and student interviewees may not represent the perspectives of other teachers in other cross-border students' schools. More interviews could generate important themes to make the arguments more convincing. Thirdly, this study lacks comparisons to show the inequality between cross-border students and local students. Future studies should compare the learning differences between the two student groups in Hong Kong. Moreover, feedback from other stakeholders (such as parents and principals) should be collected to fully understand their perspectives on the cross-border students' issue. With more evidence-based support, the government, schools, and educators could understand the challenges cross-border students face in their online learning journey and design appropriate strategies and interventions to facilitate their online learning. In this way, cross-border students could narrow their educational gap and continue their studies after class suspensions.

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