


## Article

# E-Service-Learning during the COVID-19 Pandemic: The Experiences of Mainland Chinese Students Enrolled at a University in Hong Kong

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**Abstract:** E-learning has been proposed as a sustainable delivery method for higher education. During the COVID-19 pandemic, online/e-service-learning was widely adopted around the world as a replacement for face-to-face service learning, providing an opportunity to explore whether e-learning as a sustainable delivery method could be applied to service learning. The present study adopted a qualitative approach to investigate the e-service-learning experiences of Mainland Chinese students studying at a Hong Kong university with regard to their general perceptions about the e-service-learning projects, perceived learning gains, and factors associated with their learning gains. A total of 28 undergraduates who participated in e-service-learning in the 2020/21 academic year were recruited from different faculties of the university. Seven focus groups were established with the participants. The results showed that Mainland Chinese students generally had positive perceptions about their experiences in e-service-learning during the pandemic. They appreciated the convenient and effective online learning and service, although they needed contact that is more direct with service recipients to deepen their reflection. Students perceived that they had improved their problem-solving skills and subject knowledge; they also gained meaningful personal growth and positive emotions through e-service-learning. Facilitators of and barriers to students' effective learning were also identified. The findings provide important evidence for the effectiveness of e-service-learning from the perspective of Mainland Chinese students at Hong Kong universities and the potential of e-service-learning as a sustainable delivery method for service-learning programs in the post-pandemic era.

**Keywords:** service learning; online; university; Mainland Chinese students; Hong Kong



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## 1. Introduction

One critical issue in contemporary society is the increasing threat of global warming. To address this issue, online courses have been proposed as a sustainable delivery method since they consume less energy and emit lower levels of carbon dioxide compared to campus-based courses [1,2]. However, it was not until after the outbreak of the COVID-19 pandemic that online teaching and learning became widely adopted around the world to replace face-to-face teaching and learning [3]. The rapid shift from face-to-face to online instruction presented great challenges to service learning—an educational approach whereby students apply what they have learned in the classroom to community service and are guided to reflect on their service experiences to deepen their understanding of what they have learned and develop a sense of civic responsibility. The effectiveness of service learning heavily relies on the extent to which students engage in the service and the depth of their personal reflections on integrating knowledge and service [4]. It is questionable whether students will still be able to “achieve real objectives for the community and deeper understanding and skills for themselves” [5] (p. 1) having participated exclusively in online service learning during the COVID-19 pandemic.

### *1.1. Service Learning and E-Service-Learning*

Service learning is widely recognized as “a form of experiential education in which students engage in activities that address human and community needs together with structured opportunities for reflection designed to achieve desired learning outcomes” [6] (p. 3). The literature shows that service learning is beneficial to multiple stakeholders, including but not limited to students, among whom it can promote academic learning, help develop a sense of social responsibility, and foster citizenship [7]. Moreover, service learning directly contributes to the community and serves people in need by promoting their well-being [8].

With the development of information technology, e-service-learning or online service learning emerged and showed advantages over traditional service learning in terms of sustainability. For instance, it benefits environmental protection by reducing carbon dioxide emissions as it eliminates the need for students to travel to and from service sites and reduces the energy consumption for accommodation on service sites [1,2,9]. It also benefits economic sustainability. Without expense on travel, accommodation, and paper materials, the financial cost of service learning will decrease [10]. With lower costs, universities could offer more opportunities for service learning to undergraduate students, which would contribute to economic sustainability. According to [11], there are four types of e-service-learning: online learning and on-site service (Type 1); on-site learning and online service (Type 2); learning and/or service partially on-site and partially online (Type 3); and 100 percent online service and learning (Type 4). The first three types are classified as hybrid modes, while Type 4 is considered to be an extreme e-service-learning mode [11]. Since the COVID-19 outbreak, different types of e-service-learning have gained in popularity [12].

E-service-learning is indeed not an innovation but, in the face of the sudden outbreak of the COVID-19 epidemic, educational institutions around the world quickly adjusted and switched to using electronic platforms for teaching [13,14]. Given the rapid shift from face-to-face to online instruction, there are insufficient studies on the effectiveness of e-service-learning. Furthermore, within insufficient empirical studies examining the effectiveness of e-service-learning, their findings are inconsistent. For instance, Shek et al.'s [15] study supports that e-service-learning has a similar positive impact on participating students' development to face-to-face service learning. There are also reports showing that students develop presentation skills, confidence [16], awareness of social justice, civic attitudes [17], and different leadership qualities [18] through e-service-learning, and their life satisfaction is promoted [19]. On the other hand, some scholars have reported that, compared to face-to-face service learning, the effectiveness of e-service-learning for both the community and participating students is limited, due to the restricted interaction between service providers and recipients, insufficient communication among different stakeholders, and the lack of direct on-site supervision by teachers [12,20,21]. More evidence based on rigorously designed empirical studies is needed to address whether and how e-service-learning may benefit its participants and the community.

### *1.2. The E-Service-Learning Experiences of Non-Local University Students in Hong Kong*

In the past decade, service learning has been extensively adopted by higher education institutions in Hong Kong. A few government-funded public universities have made it a compulsory component of their undergraduate programs [22,23]. During the COVID-19 pandemic, the demand for online service-learning programs in universities in Hong Kong was high because university students must fulfil this requirement to graduate. As a result, a number of e-service-learning programs were developed to cater to the needs of the students. In most cases, both students' learning and their service are designed to be conducted online, with few exceptions [15].

One particular group of students who faced issues with these e-service-learning programs is non-local students originating from Mainland China studying in universities in Hong Kong. The present study focused on this special group of students because of its special characteristics. Firstly, compared to their local peers, Mainland Chinese students

faced even greater challenges when participating in e-service-learning programs. During the COVID-19 pandemic, when face-to-face teaching and learning were suspended, most Mainland Chinese students stayed in their hometowns and took lessons online [24]. Therefore, their entire service-learning process, including classroom learning, service preparation, implementation, and post-service reflection, took place entirely on the Internet, resulting in additional challenges. First, slow network connections were prevalent, which inevitably affected students' online learning and service [25]. Second, the collaborative learning of this group of students was severely affected because they could only communicate with their peers online [19], while local students could form face-to-face discussion groups to prepare and implement their service. Third, students had difficulty accessing certain resources that are unavailable in Mainland China, such as YouTube [26]. Additionally, it is valuable to study Mainland Chinese university students because they represent a significant and growing proportion of Hong Kong's non-local university students. In 2020, of the 35,330 non-local students admitted to study in Hong Kong, 31,123 were from Mainland China [27]. Moreover, the number of Mainland Chinese students increased by 13 percent in the 2021/22 academic year [28]. Despite their growing presence in Hong Kong universities, to the best of the authors' knowledge, not many studies have focused on the service-learning experience of this student population.

While a few studies have supported the benefits of online service learning for university students in general during the COVID-19 pandemic (e.g., [19,29]), there is insufficient understanding of the experiences of Mainland Chinese students studying in Hong Kong universities. Understanding these experiences is important for several reasons. Primarily, studying the experiences, benefits, and challenges faced by Mainland Chinese students during their online service learning can provide valuable insights for program leaders and university policymakers to better support and facilitate the learning and success of this group. For example, targeted support programs could be developed and provided to these students. In addition, understanding the online service-learning experiences of Mainland Chinese university students in Hong Kong can inform researchers and educators on the unique challenges and opportunities encountered by international students, particularly those from developing countries or regions. Finally, these findings can contribute to the limited knowledge about the impact of e-service-learning on students' development [30], as it is a relatively new approach to service learning that has become more prevalent in recent years due to the COVID-19 pandemic.

Therefore, the present study utilized a qualitative approach to investigate the online service-learning experiences of Mainland Chinese students based on a purposive sample of students who took service-learning courses offered by a university in Hong Kong during the COVID-19 pandemic. This study aimed to address three research questions: (1) What are Mainland Chinese students' perceptions and attitudes toward their online service-learning experiences? (2) How do they perceive their learning gains from online service learning? (3) What are the perceived facilitators and barriers that contribute to or affect students' effective online service learning?

### *1.3. Theoretical Background*

Experiential learning theory [31] laid the foundation for service learning by emphasizing "learning by doing". Kolb [32] developed an experiential learning circle including four stages: concrete experience, reflective observation, abstract conceptualization, and active experimentation. This period of active experimentation provides new experiences that feed into further learning cycles. The four stages have been used in the service-learning process [33,34]. To learn about students' e-service-learning experience and associate barriers and facilitators, we investigated both service and learning aspects.

## 2. Materials and Methods

### 2.1. Participants and Procedure

The target population of this study was Mainland Chinese students who were studying at one public university in Hong Kong and participated in e-service-learning during the 2020/21 academic year. This university offered 55 service-learning courses from 26 departments during the 2020/21 academic year. Participants were recruited with a poster, and the snowball sampling method was used for further recruitment from August 2021 to November 2021. Finally, a total of 28 students agreed to participate in this study. All students who agreed to participate signed written consent forms before the interviews.

Focus group interviews were conducted with the 28 Mainland Chinese students taking ten service-learning courses (see Table 1 for more details), aged between 19 and 22 (mean = 19.89 ± 0.79). Their year of study ranged from Year 2 to Year 4. Of the 28, 16 were female (57%; mean age = 19.63 ± 0.62) and 12 were male (43%; mean age = 20.25 ± 0.87).

**Table 1.** Distribution of participants in different service-learning courses (N = 28).

Course	Service Location	No. of Participants	Host Department
SL01	Mainland	6	Biology and Chemistry
SL02	Mainland	5	Social Science
SL03	Philippines	1	Biomedical Engineering
SL04	Tai Wan	4	Chinese and Bilingual Studies
SL05	Africa	1	Computing
SL06	Tai Wan	1	English
SL07	Vietnam	2	Hotel and Tourism Management
SL08	Hong Kong	5	Industrial and Systems Engineering
SL09	Hong Kong	1	Management and Marketing
SL10	Hong Kong	2	Design

Semi-structured interviews were conducted in seven focus groups by two trained research staff. Each interview lasted 45 to 90 min and was audio-recorded with the participants' consent. The project was approved by the Human Subjects Ethics Sub-Committee (HSESC) of the first author's institution.

### 2.2. Service-Learning Courses

Table 2 shows the 10 service-learning courses taken by participants. SL01 involved assisting farmers and the community with agricultural production. SL02, SL03, SL06, and SL08 involved developing educational materials and implementing educational services for disadvantaged children or adolescents, to improve the thinking of adolescents and extend their potential. SL04, SL05, and SL10 aimed to provide support to ethnic minorities, especially the elderly, through the use of technology or skills to visualize history, culture, valuable experiences, and social problems. These three courses aimed to manifest a spirit, inherit and preserve culture, or highlight social issues. Finally, SL07 and SL09 contributed to environmental improvement in local communities through university students' promotion of ecotourism or efforts to address environmental issues. The two courses aimed to construct a green community. The service recipients on the 10 courses were approached by teachers in universities who have a connection with service recipients.

**Table 2.** Ten service-learning courses taken by participants.

Course	Service Recipients	Main Service Content	The Aim of Service
SL01	Farmers	Educating farmers and the community on agricultural production	To enhance the efficiency in using various resources and raising productivity level
SL02	Underprivileged children and adolescents	Developing and implementing educational and supportive service	To explore the strengths and potentials of the service recipients

Table 2. Cont.

Course	Service Recipients	Main Service Content	The Aim of Service
SL03	Students in resource-poor secondary schools.	Teaching STEM concepts and theories to children	To cultivate a spirit of scientific literacy and thinking
SL04	Ethnic minorities and the difficulties in livelihood	Assisting the community to record its oral history specifically around the elderly	To protect the endangered people and cultures
SL05	Ethnic minority or refugees	Working together with peers from the other overseas universities to co-design and build a virtual world to present a social issue	To plan different technical-related events/activities to serve clients
SL06	Primary school children from underprivileged communities	Students are responsible for developing relevant teaching materials before the service and presenting them at a language workshop	To provide language support
SL07	Local communities	Helping the local community to develop/improve ecotourism	To promote the service site
SL08	Children in secondary schools with insufficient support	Teaching STEM (Science, Technology, Engineering and Mathematics) concepts and theories	To cultivate a spirit of scientific literacy and thinking
SL09	The communities facing environmental challenges and environmental NGOs (Non-Government Organizations)	Addressing specific environmental issues faced by affected communities with an environmental NGO	To contribute in building green communities
SL10	Elderly people	Assisting the senior citizens to visualize/reconstruct their invaluable personal experiences in the form of a book	To send copies of the publication based on the information the service recipients provided

### 2.3. Interview Protocol

The interview protocol used in this study was adapted from a prior study that evaluated undergraduates' learning experiences [35]. We adapted the interview questions to suit the service-learning courses in our study. The interview protocol consisted of three main parts. The first aimed to explore the overall experiences of participating in e-service-learning courses, including information about the online services provided (such as service targets, service content, and duration). The second part focused on students' perceived learning gains. The guiding question is "when studying this course, what were your greatest gains?" Since the service-learning courses involved learning knowledge and then applying it in practice, students were encouraged to elaborate on this question with reference to both the learning and service components. The final part investigated the students' perceptions of the barriers to and facilitators of effective learning through e-service-learning projects during the pandemic.

### 2.4. Data Analysis

Thematic analysis was used to analyze the qualitative data obtained from the focus group interviews. Transcripts of each focus group were completed immediately after the session. The six-phase theoretical framework for thematic analysis developed by Braun and Clarke [36] was adopted to analyze the data. This involves (1) reading and rereading the transcripts to become familiar with the focus group content, (2) generating initial codes, (3) organizing codes into themes, (4) reviewing themes to ensure that they accurately reflect the meanings within the focus group discussions, (5) naming themes, and (6) writing up the analysis of the data.

To ensure the credibility of the coding process, a second researcher independently coded three randomly selected transcripts of the interviews in addition to the original coder. The agreement between the two coders was calculated using Miles and Huberman's [37]



formula for interrater reliability, as follows: reliability = number of agreements/(total number of agreements + number of disagreements). The interrater reliability agreement between the two coders was 85 percent, indicating very good agreement [38].

### 3. Results

The focus group data provided a comprehensive understanding of the learning experiences of Mainland Chinese students who took e-service-learning courses at the university during the pandemic. The findings are presented in three sections below, in correspondence with the interview protocol, exploring the (1) general learning experiences, (2) perceived learning gains, and (3) facilitators and barriers that either contributed to or impeded their effective experience of e-service-learning. Thirteen themes are shown in Table 3.

**Table 3.** The learning experience of Mainland Chinese students in e-service-learning.

Areas	Themes
General learning experiences	Generally positive perceptions of e-service-learning experiences Convenient and effective online learning and service Limited service experiences due to the impossibility of on-site service
Perceived learning gains	Enhanced problem-solving skills Expanded subject knowledge Development of personal qualities Positive emotions
Facilitators of and barriers to effective e-service-learning experience	Facilitator 1: Well-prepared service-learning teachers Facilitator 2: Clear and logically organized arrangements Facilitator 3: Rich multicultural online exchanges Barrier 1: Lack of opportunities to practice on-site Barrier 2: Problems in online communication Barrier 3: Unstable internet connection

#### 3.1. General Learning Experiences

In the first area, three main themes were identified: (1) generally positive perceptions of e-service-learning experiences; (2) convenient and effective online learning and service; and (3) limited service experiences due to the impossibility of on-site service.

##### 3.1.1. Generally Positive Perceptions of E-Service-Learning Experiences

Overall, the students had a positive attitude toward their e-service-learning course in terms of both learning and service. With regard to learning, they felt that the quality of teaching provided was not diminished in the online mode. Teachers' assistance greatly motivated and supported the students in their e-service-learning experience. As for the service component, students spoke positively about their team members, service recipients, and the outcomes of their service. Below are some student narratives demonstrating their opinions:

- "The service recipients were great to work with, the communication was friendly, and the teacher also assisted us in contacting the service recipients. The teacher was very dedicated to teaching. Overall, I am satisfied with the quality of service provided by myself and my team members." (Participant 4 from SL001)
- "Regarding the overall learning process, although there were many things that needed to be prepared, it was manageable with the help of the teacher, who guided us step by step. The teacher was always available to assist us, which made the tasks easier to accomplish. I found the service period to be a positive experience as well. It was great to work with the team and communicate with the children. The children's response to

us was very enthusiastic. Ultimately, I received a good grade, which was satisfying.” (Participant 11 from SL002)

- “As there was no significant difference between the online and offline teaching content, it was possible to maintain a high level of teaching quality. Moreover, this project helped address certain issues faced by local farmers.” (Participant 5 from SL001)

### 3.1.2. Convenient and Effective Online Learning and Service

Students believed that e-service-learning was effective and convenient as it overcame geographic limitations and avoided travel time for students. It also provided flexibility. Moreover, it facilitated cultural and knowledge exchange, enabling both service recipients and providers to learn more from a distance. The following narratives illustrate these opinions:

- “Online service-learning streamlined the overall process of this course, eliminating the need for excessive back-and-forth communication. Most tasks were completed online through video calls and document sharing, which made the learning process more efficient and convenient. As a result, the amount of time required to complete the course was reduced, and students were able to integrate coursework into their schedules more easily. This allowed for faster completion of the assignments and a more convenient learning experience.” (Participant 16 from SL004)
- “Due to the pandemic, video calls were used to connect with service recipients from around the world. So, the children had the opportunity to see the university campus and classrooms, and classmates from different parts of China were able to showcase their hometowns and communicate through video. This approach was actually an improvement on traditional service-learning methods.” (Participant 7 from SL002)

### 3.1.3. Limited Service Experiences Due to the Absence of On-Site Service

Because of the impossibility of on-site visits, students were unable to fully immerse themselves in the service community and experience its unique context and culture. Consequently, some of the services that students provided lacked the real utility that could have been achieved through fieldwork measurement data. Additionally, online observations of service recipients’ responses were less direct and convenient than in-person interactions. These limitations reported by students provided valuable insights into the importance of on-site visits and the need for alternative methods of service delivery in the face of unforeseen circumstances. Students’ reflections are as follows:

- “As a result of being unable to conduct field investigations, we were limited in our ability to gather information and data for our project. The lack of local experimentation meant that our project was largely theoretical and lacked practical application. Furthermore, the inability to go offline and learn in person hindered our personal gains from the project and limited our experience and knowledge. These challenges made us realize the value of hands-on experience and the need for alternative methods of learning and data gathering when in-person interactions are not possible.” (Participant 5 from SL001)
- “When learning online, it can be challenging to keep track of the source and content of the information you receive, so preparation beforehand is crucial. In a physical classroom, you can adjust your teaching approach in real-time based on the atmosphere and reactions of your service recipients. However, when the classroom is online, these cues may be delayed or less noticeable.” (Participant 7 from SL002)

## 3.2. Perceived Learning Gains

Regarding the second area, students’ perceived learning gains can be categorized into four themes: (1) enhanced problem-solving skills, (2) expanded subject knowledge, (3) development of personal qualities (such as resilience and citizenship), and (4) positive emotions.

### 3.2.1. Enhanced Problem-Solving Skills

Throughout the e-service-learning process, students were often faced with unique situations involving service recipients and unexpected challenges in distance learning. This necessitated the development of innovative and effective solutions, leading to improvements in problem-solving skills. Students described such experiences:

- “Our group was tasked with serving school children who had difficulty concentrating. In preparing materials, we found that providing more detailed and engaging content was effective. For instance, we used vivid photos and videos to capture the students’ attention, and found this to be highly effective. As a result, we made sure to include at least ten visual stimuli in our presentations.” (Participant 21 from SL008)
- “We were scheduled to teach a painting class to primary school students as part of our service project. However, the colored pens I had purchased for the class were mistakenly delivered to another primary school by the express delivery company. Despite our initial difficulty in locating the missing supplies, we were able to communicate with local school teachers and the delivery company, and finally resolved the issue within a single day.” (Participant 9 from SL002)
- “We had a heavy workload and faced various technical problems like internet connectivity issues. While providing our services, we also encountered many unforeseen issues. We explored all possible solutions, including using pictures, videos, and messages, and we implemented all of them until we successfully conveyed all the necessary information to our service targets.” (Participant 17 from SL005)

### 3.2.2. Expanded Subject Knowledge

Service learning has unique characteristics that require students to gain practical knowledge and learn about the background and special circumstances of their service recipients, usually a disadvantaged group. Throughout the course, students acquired various skills and expanded their subject knowledge:

- “In preparing for the service, the teacher taught us some useful sketching skills, which I found to be quite practical. I also gained knowledge on typesetting and printing techniques in the process.” (Participant 28 from SL010)
- “This course has provided me with a valuable opportunity for personal growth and insight. Prior to taking this course, I had limited knowledge about the numerous ethnic minorities in Taiwan, and the unique challenges they faced when entering Taiwan as brides, laborers, or foreign students. Through this course, I gained a deeper understanding and appreciation of their experiences, which has significantly broadened my perspective.” (Participant 14 from SL004)
- “One of the main benefits I gained from this service-learning course was a better understanding of the cognitive and developmental processes of elementary school students in Hangzhou. Through careful observation, analysis, and study of their behaviors based on theories we learned in the lectures, I was able to gain insights into the unique ways in which children in this age group think, behave, and develop key skills. These insights have helped me to better understand the reasons behind their behaviors.” (Participant 8 from group SL002)

### 3.2.3. Development of Personal Qualities

Students universally recognized that e-service-learning helped them develop multiple positive qualities in areas, such as resilience, leadership, and citizenship, through serving others and overcoming challenges:

- “I have developed the ability to resist pressure and handle crises effectively through the course, which required independent thinking to achieve its challenging goal.” (Resilience) (Participant 2 from SL001)
- “During this e-service-learning course, I had the opportunity to exercise my leadership skills as the coordinator of our group. I communicated with the supervisor outside the



group and was responsible for arranging all of our group's assignments." (Leadership) (Participant 8 from SL002)

- "The online service had a profound impact on me. I felt like I was genuinely helping people to solve their problems and to live better as a responsible global citizen [civic responsibility]." (Participant 15 from SL004)

#### 3.2.4. Positive Emotions

Students expressed that service learning provided them with many positive emotional experiences, including a sense of satisfaction and joy. Their statements regarding their experiences include:

- "When we were teaching primary school students how to connect circuits, they encountered some difficulties. However, after successfully completing the task, the students erupted into screams and applause. Witnessing their excitement and sense of accomplishment made the entire service experience worthwhile. As a token of appreciation, these students recorded a short but thoughtful video for us, which brought us a lot of joy and happiness." (Participant 12 from SL003)
- "For me, the most significant gain from the service experience was the emotional connection I developed with the children. While it was not necessarily a gain in knowledge, it left me feeling fulfilled and warm inside. Initially, I had assumed that the children would not form any attachments during our five-day service, but I was surprised to see them cry when it was time to part ways with us." (Participant 11 from SL002)

#### 3.3. Facilitators of and Barriers to Effective E-Service-Learning

Three major themes emerged as facilitators of students' effective e-service-learning experience: (1) well-prepared service-learning teachers who play a critical role in providing clear instructions and coordinating the program effectively; (2) clear and logically organized arrangements, including a reasonable schedule and effective procedures, which help students to stay on track and achieve their objectives efficiently; and (3) rich multicultural online exchanges, including cross-cultural exchanges between Mainland Chinese and local Hong Kong students, and exchanges between students and service recipients, which help broaden students' perspectives and enhance their cultural awareness.

On the other hand, three major barriers were identified that could prevent students from gaining positive service-learning outcomes: (1) lack of opportunities to practice on site, which limits students' ability to apply what they have learned in real-world contexts; (2) problems with online communication (e.g., miscommunication among groupmates during service and insufficient communication with service recipients), which had a negative impact on the effectiveness of the program; and (3) unstable Internet connections, which disrupted the flow of the online service and caused frustration for students.

##### 3.3.1. Facilitator 1: Well-Prepared Service-Learning Teachers

Well-prepared teachers were considered by students to play a significant role in service learning by enriching their knowledge and skills necessary for conducting service and by providing timely support whenever they had questions or needed advice. Teachers also helped students arrange meetings with service recipients and recruited volunteers on site to facilitate the service-learning process. Students frequently stated that the dedicated efforts of their teachers greatly contributed to the success of their service learning.

Students highlighted the benefits they gained from teachers' clear instructions and feedback in e-service-learning:

- "The professor delivered excellent lectures online and was highly responsive to emails or messages even after class. For instance, when we had questions while working on assignments, she provided us with prompt feedback." (Participant 10 from SL002)

- “Throughout the service period, students had daily exchange meetings where the teacher provided feedback and highlighted areas of success as well as areas that needed improvement.” (Participant 18 from SL006)

Teachers’ coordination of the whole process was highly appreciated by students and contributed significantly to a smooth and successful service-learning experience. Here is what some students shared:

- “As a student, I was not able to contact the community directly, but with the help of teachers, we were able to schedule a meeting with them at a convenient time.” (Participant 4 from SL001)
- “To help us prepare the service content, the teacher made efforts to arrange for local volunteers to assist us in collecting local information and it was extremely helpful.” (Participant 6 from SL001)

### 3.3.2. Facilitator 2: Clear and Logically Organized Arrangements

The students found the clear and logically organized service arrangements, which included a reasonable schedule and effective procedures, such as rehearsal of service provision and e-learning modules, helpful in better preparing for service. Such arrangements also facilitated efficient and high-quality service progress, enabling students to work independently.

A reasonable schedule provided students with enough time to prepare for and fully experience a service-learning project. The following are some student narratives that illustrate the importance of a good schedule:

- “A semester of three months, plus vacation, provided us with a longer course that allowed for ample participation in service-learning. This creative format was a new experience for us, and the extra time and depth of teaching helped us to fully understand the people we wanted to serve and the needs of the service recipients.” (Participant 6 from SL001)
- “I found the arrangement of lectures and communication with the service recipients to be reasonable. In particular, during the final few weeks of the semester, when there were no dense lectures, we had sufficient time to prepare for the final examination and complete the course requirements without feeling overwhelmed. I believe this arrangement was beneficial for our learning in the course.” (Participant 16 from SL 004)

Effective procedures for preparation helped students to better engage in the service project. The following narratives from students illustrate this point:

- “In March, we had an online rehearsal to familiarize ourselves with the English proficiency of primary school students in Taiwan and to develop a teaching plan. The rehearsal process was similar to when we taught the service recipients. This allowed us to identify and address any technical issues beforehand and be mentally prepared for the formal teaching sessions. Having had this rehearsal, we felt more confident and prepared for the actual teaching experience.” (Participant 18 from SL006)
- “The teaching content of the e-learning module was concise, efficient, and intuitive, which provided a solid foundation for subsequent course and service.” (Participant 2 from SL001)
- “Before the service-learning project began, a pre-review was conducted to ensure that the project was on the right track. This was done to assess whether any major changes were needed, in case the project needed to be completely overhauled.” (Participant 1 from SL001)

### 3.3.3. Facilitator 3: Rich Multicultural Online Exchanges

The participating Mainland Chinese students shared that they engaged in online cross-cultural exchange with local Hong Kong students, international students, and service recipients from diverse cultural backgrounds. The diverse perspectives and performance of Hong Kong local and international students contributed to broadening Mainland Chi-

nese students' horizons and improving service outcomes. Moreover, multicultural online exchanges enabled students to react more appropriately and adapt better in the service-learning process. Students shared these points in the narratives below:

- “We had two assignments focusing on ethnic minorities in Hong Kong. I found that the local students had a much deeper understanding of the issue than I did. I was surprised to learn about the NGOs in Hong Kong, as I had no prior knowledge of them. The local students were able to provide specific examples and share many ideas on how to address the challenges faced by ethnic minorities. Overall, I learned a lot from their knowledge and insight.” (Participant 14 from SL004)
- “The online service-learning provided many opportunities for cross-cultural interaction, as we engaged with service recipients from diverse backgrounds. The service recipients in the United States were very active, which motivated us to be more active as well. However, the service recipients in Africa were less active, and we had to find ways to mobilize them. It was interesting to observe the cultural differences between the two groups and how they impacted our approach to service delivery.” (Participant 17 from SL005)
- “My special experience during service-learning was realizing the cultural differences between Hong Kong and Mainland China. At the beginning, my group was unsure whether to bring small gifts for the clients, but we learned that it is not appropriate to give gifts to those who may have a conflict of interest with us in Hong Kong. I discussed this with my teacher, who suggested that we write greeting cards instead to convey our good intentions. This experience taught me the importance of integrating with the local culture and being sensitive to cultural differences even when we have good intentions.” (Participant 21 from SL008)

#### 3.3.4. Barrier 1: Lack of Opportunities to Practice on Site

Several students felt that the lack of opportunities to practice on site resulted in low efficiency during online collaboration and slow response to service recipients' reactions. For services that required on-site measurement, the quality of the service was compromised. Here are some examples of the issues raised by the students:

- “We did not have enough opportunities for practical operations or on-site field visits. For instance, in my case, I was working on automation equipment, and I needed to investigate the specific situation of a greenhouse to determine the optimal placement of sensors and lines. Without the opportunity for on-site visits, it was challenging to design an effective solution.” (Participant 3 from SL001)
- “When working offline, we could adjust our service progress in real time by observing the atmosphere and reactions of service recipients. However, when working online, it was more challenging to observe these reactions, resulting in a slower response time.” (Participant 7 from SL002)
- “I felt that the online service-learning mode had little impact on learning, but a significant impact on service. As we worked in groups, continuous online communication might not allow the team members to know each other very well, which could lead to a sense of alienation when starting the service. In contrast, when working on-site, we could spend more time together, which improved the quality of service.” (Participant 10 from SL002)
- “The knowledge we taught children needed to be linked to practice, and we couldn't assume that the children could really apply the knowledge in practice just by discussing it online. Teaching action-based skills online was challenging, and it was less efficient than teaching face-to-face.” (Participant 25 from SL008)

#### 3.3.5. Barrier 2: Problems in Online Communication

Communication issues arose among team members and between service providers and recipients when they could only meet online. Many stakeholders of the service-learning project did not know each other, leading to challenges in online communication. When

conflicts of ideas arose among students, it became difficult to reach a consensus. Moreover, communication between students and service recipients was limited due to a lack of time.

Students with different backgrounds and interests may experience conflict when communicating. Some students shared their experiences through the following narratives:

- “This was my first time working with other Mainland Chinese students I didn’t know at all. It was challenging to communicate with team mates who had completely different interests. It took a lot of time to divide the workload due to these communication issues. Since we couldn’t see each other’s facial expressions, it was difficult to gauge the other’s emotions and the degree of communication was not easy to determine.” (Participant 4 from SL001)

Students also had limited familiarity with their service recipients due to the limited online communication time. The following are some of the students’ experiences:

- “One of the issues was that we had limited communication time with the service recipients, only 15 min before starting the service. Since we did not know much about the service recipients beforehand, we were unable to ask meaningful questions and gather useful information within the limited time.” (Participant 8 from SL002)
- “Perhaps due to the online mode, it was difficult to have effective communication with the service recipients. Our communication was limited to only a short time during the class and a ten-minute break. Moreover, after the service recipients turned off the online platform, we had no further communication with them.” (Participant 9 from SL002)

### 3.3.6. Barrier 3: Unstable Internet Connection

During the service delivery, both students and service recipients encountered issues with unstable internet connections, including problems with video playback, microphone sound quality, VPN connections, and online meeting connections. Many students reported experiencing these technical problems, as illustrated in the narratives below:

- “I had to use a VPN while on the Mainland, but it was not stable. I couldn’t tell whether it was my VPN or my network that was unstable because I couldn’t see the issues on my screen. Additionally, the microphone quality was poor in the primary school we served.” (Participant 18 from SL006)
- “When we were designing the course, we included some videos. During our testing phase, the video played smoothly, but when we began providing the service, the video kept freezing.” (Participant 9 from SL002)
- “We were especially embarrassed when we first met the children we were serving, as the internet connection suddenly cut out and we were unable to see the service recipients. This had a significant impact on our ability to teach effectively.” (Participant 23 from SL008)

## 4. Discussion

This study explores the online service-learning experiences of a unique group of non-local students studying in Hong Kong universities (i.e., students from Mainland China) during the pandemic and shows the sustainability of e-service-learning. Economically, Mainland Chinese university students who participated in e-service-learning saved on transportation costs by staying in Mainland China. Similarly, e-service-learning is of great value for disadvantaged students in some developing countries or for students who cannot afford the high expenses of international service learning. For example, an online tool called Appropedia.org allows students to add, remove, or edit information, enabling them to conduct online engineering service learning [39]. Environmentally, e-service-learning has been reported to reduce carbon emissions. Caird et al. [1] found that campus-based (face-to-face) courses consume considerably more energy and have a higher carbon footprint than distance learning or online courses. One of the largest contributors to a reduction in energy consumption is student travel. Versteijlen et al. [2] also found that the introduction of online

education can lead to a significant reduction in carbon emissions and could help universities meet the Sustainable Development Goals. Therefore, the large-scale implementation of e-service-learning will contribute to energy conservation and environmental protection. In addition to the environmental protection benefits, e-service-learning also contributed to social sustainability. The majority of students had a positive perception of their online service-learning experiences. They found online learning and service to be convenient and effective, leading to meaningful learning gains in multiple areas. Facilitators and barriers were identified at various levels of program design, service arrangement, teaching staff, and technological support. These findings are essential for service-learning course designers, teachers, and researchers to refine existing courses and to develop new service-learning projects in a sustainable manner in the post-pandemic era.

Consistent with previous findings based on university students participating in online service-learning programs [11,40,41], our findings support that Mainland Chinese students in Hong Kong had positive perceptions about their e-service-learning experiences, which were predominantly Type 4 or extreme online service learning. Students expressed satisfaction with the quality of teaching in the online mode and reported meaningful learning gains in terms of their problem-solving skills, subject knowledge, personal growth (including the development of citizenship), and positive emotions. These perceived learning outcomes are similar to those of on-site service-learning programs [42] and other types of service learning (e.g., Type 2, [16]; Type 3, [43]). In other words, students' perceived quality of teaching in e-service-learning did not suffer due to its delivery mode. Therefore, capitalizing on this potential sustainability can go hand in hand with maintaining teaching quality in e-service-learning. Moreover, for Mainland Chinese students who were unable to return to the university and travel to the service site, the Type 4 online service-learning approach eliminated geographical constraints and provided them with opportunities to acquire necessary knowledge and skills online and apply them in online service settings, which substantially enriched their learning experiences during the pandemic.

In particular, students mentioned that the online platforms (such as OneDrive Document) used in the e-service-learning made group assignments more efficient as individuals could work on their respective parts simultaneously. They were also able to make good use of the technology to deliver a service that could not be achieved in traditional on-site service learning, such as presenting the university's campus and classrooms to service recipients in real time. Scholars have argued that online service learning infuses twenty-first-century skills and develops students' digital citizenship [33,44]. In the present study, the unique benefits of e-service-learning are demonstrated by students' mastery of using various online platforms and technologies to deliver online services, which may outperform traditional service learning. Students' development in these aspects will also enable them to continue benefiting from online service-learning programs and other online education in the post-pandemic era.

While the students generally had positive experiences of online service learning, some reported that they were unable to fully engage with the service community due to the lack of one-site experiences. This issue was particularly evident for students in STEM disciplines, as their service projects often required direct interactions with the environment, such as the collection of geographic data and on-site experiments [30,45]. Conversely, students who participated in services that primarily involved interactions with service recipients, such as online teaching, reported fewer issues due to the advanced development of online communication technology [46]. This disparity in students' learning experiences highlights the unique challenges faced by STEM disciplines in providing online service learning, which should be taken into account in future project development. Program designers in STEM disciplines may consider adopting a hybrid mode that provides the convenience of efficient online communication and presentation tools while allowing students to take part in essential on-site work [47]. Due to the limited sample size for each program in the present study, it was not possible to compare the impact of STEM discipline-based service-learning programs and non-STEM programs in online settings. Future studies

should systematically examine the implementation process and outcomes of online service learning across different disciplines to identify the associated benefits and challenges.

Students perceived well-prepared teachers as playing a critical role in facilitating their online service learning. These teachers not only provided clear instructions and support to guide students' learning and service online but also organized service arrangements, which was considered another important facilitator for effective student learning. This highlights the importance of teacher training to maximize students' success in online service learning. Researchers have suggested that teachers should be trained in online instructional technology to assess both students' and community partners' capacity before starting online services [11,48]. Teachers should also work closely with the community partner to ensure that the service is appropriate for online settings and clear to all parties. Additionally, students reported that an online rehearsal or pilot run of the service helped them better prepare, both mentally and technically. Such practices have been recommended by researchers and should be promoted among online service-learning programs.

Another facilitator mentioned by students was the provision of opportunities for rich multicultural online exchanges. The online model allowed students to organize and participate in projects with people from different cultures all over the world, breaking the constraints of time and space. This places higher demands on students' organizational and adaptive skills. Through communication and cooperation with multicultural partners, students experienced cultural differences and gained skills to deal with them, laying the foundations for the future international work environment [49]. Program designers may consider leveraging this advantage of online service learning to promote students' intercultural competence in the future [50].

On the other hand, it has been revealed that students' online service was negatively affected due to the lack of opportunities to practice on site, especially for the services that required field visiting and practical application. This suggests that e-service-learning may not be suitable for all types of services. For instance, services that involve working on automation equipment for a specific community may be limited in their ability to be provided through e-service-learning. Therefore, e-service-learning poses a challenge for service providers.

In addition, problems encountered in online communication and unstable network connections hindered the effectiveness of online service learning. The limited time available for online communication resulted in insufficient understanding among different stakeholders, such as students, service recipients, and community collaborators. Students also reported that they were unable to modify their service content due to the lack of timely feedback from service recipients. In addition, a lack of in-depth communication among service providers from different backgrounds created difficulties in their collaboration during service.

To address these issues in the future, more real-time virtual sessions could be provided to establish strong relationships between students and service recipients and community partners [11,15,51]. It is also necessary to develop a solid instructional design that facilitates online communication among group members [52–55]. Furthermore, technology supporting online service learning, such as unstable internet connections, remains a significant barrier, consistent with previous findings [20,56,57]. Although a technological support team can mitigate some of these problems, students who provide service from home, such as the Mainland Chinese students in this study, may still encounter difficulties that cannot be adequately addressed. Therefore, it is important to consider the unique challenges faced by students who provide service from home [55], particularly those in countries or regions with limited technological infrastructure. Additional support may be necessary. This could include offering extra training to help students overcome any technological barriers they may face when providing service at home. Specific curriculum designs that allow for diversified forms of online service that do not require synchronous online communication can also be helpful.



Furthermore, in the post-pandemic era, exploring the potential of integrating online and offline modes will also be significant. For instance, for services that involve field surveys, online forum discussions could serve as a substitute for face-to-face communications. For services that involve on-site practice, it may be better to encourage students and service recipients to practice on site. This way, both online and offline modes could be used to offer a better e-service-learning experience.

Moreover, the study showed the sustainability of e-service-learning in terms of economic, environmental, and social sustainability. Economically, e-service-learning can save the costs of traveling to and from service sites and accommodations at service sites for Mainland Chinese university students and hosting universities. With lower costs, the service-learning opportunities can cover more students in a single academic year and can continue in future academic years. In other words, e-service-learning can be economically sustainable. Environmentally, e-service-learning has been reported to reduce carbon emissions and energy consumption. Caird et al. [1] found that distance-based courses reduced energy consumption by 88% and carbon emissions by 85% when compared with campus-based courses. They also reported that travel is one of the largest contributors to carbon emissions. Versteijlen et al. [2] found that the introduction of online education can lead to a significant reduction in carbon emissions and could help universities meet the Sustainable Development Goals. Socially, e-service-learning provides significant benefits for disadvantaged students in developing countries and those who cannot afford the high expenses associated with international service learning.

The present study has several limitations that need to be acknowledged. Firstly, the heterogeneity of the programs was not analyzed, and how this may have influenced the program's impact was not examined. The participants were recruited from ten programs with different learning objectives, sites of visit, and durations, which inevitably affected their learning experiences and perceptions of their program. The differences between service recipients and service approaches across programs may have led to differences in how students were impacted by their service experience and how they perceived what they gained during online service learning. Due to the small sample size, cross-program comparisons were not possible, and further data and analyses are needed to better understand the impact of program heterogeneity on e-service-learning effectiveness.

Secondly, recall bias may have influenced the findings of this study. The interviews were not conducted immediately after the participants' online service-learning experiences, which may have led to inaccurate recollection of the learning process. Moreover, this study used a focus group method to collect data from respondents. Their responses may have been influenced by the presence of their peers, potentially leading them to withhold some thoughts or express responses that others wanted to hear [58].

Thirdly, all participants in the present study were Mainland Chinese students from one university in Hong Kong who constituted only a small portion of non-local university students there. Therefore, our findings may not be generalizable to other student populations, such as local students in Hong Kong or international students. It would be useful to conduct comparative research [59] across different sites or populations to gain a comprehensive understanding of e-service-learning experiences in the future. Future research could include a wider range of participants, such as students, service recipients, and faculty members.

Fourthly, this study did not assess the extent to which e-service-learning contributes to sustainability. Therefore, it would be beneficial for future research to investigate the impact of e-service-learning on sustainability through empirical evidence.

## 5. Conclusions

Despite the limitations, the findings of the present study provide crucial evidence supporting the effectiveness of online service learning among Mainland Chinese students in universities in Hong Kong and the potential of e-service-learning as a sustainable delivery method for service-learning programs in the post-pandemic era. Online service learning

can be an effective pedagogy that promotes students' development in multiple areas, particularly when well-prepared teachers, clear and organized service arrangements, and rich multicultural exchange opportunities are provided.

It is worth noting that the absence of physical participation during service learning may hinder students from applying theoretical knowledge in real-world scenarios and gaining practical reflections. Thus, when designing service-learning projects, potential developers should carefully consider the applicability of the online mode and take care to avoid barriers, such as the lack of on-site experiences in complex environments. A hybrid mode can be an excellent alternative, leveraging the benefits of online learning, such as quick communication and clear course structure, while retaining the valuable on-site experience that service learning provides. Thus, identifying existing successful programs and their exceptional practices as examples of best practice can provide guidance and benchmarks for other similar programs. This approach is becoming necessary and beneficial for the development of online service learning.

The present study contributes to the literature on the evaluation of online service learning and offers valuable insights for researchers and educators interested in developing high-quality e-service-learning projects that can extend the benefits of service learning to more students through online modes in a sustainable manner. It is important to recognize that online service learning is not a one-size-fits-all approach. The effectiveness of online service learning may vary depending on factors, such as program design, teaching staff, the quality of the online platform, academic discipline, and the type of service project. These factors should be taken into account when designing and implementing online service-learning programs to maximize their effectiveness while enjoying their advantages of sustainability.

Furthermore, the research results have managerial implications for government and education institutions. Governments and educational institutions should provide network service resources, invest in teacher training, and promote the construction and optimization of e-learning platforms to improve the teaching effectiveness of e-service-learning. In the post-epidemic era, it is more sustainable for society as a whole to consider the possibility of combining the advantages of fast and convenient online discussions with more direct offline face-to-face communication.

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