Remote Learning Responses to the COVID-19 Situation in Creating Collaborative Learning Environment: Cases from Nagasaki's Public Schools

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ABSTRACT

This paper examines collaborative learning environment through remote learning in local government. While COVID-19 brought pedagogical and financial challenges to public schools that were already experiencing crises in the management of their educational programs, it also created new opportunities to strengthen relationships and create institutions that will bring out the resilience needed to bounce back stronger and better than before. Government-led approaches to introduce ICT into the educational environment have become even more important in the during the COVID-19 disaster, and in this crisis, public school education in remote areas, including remote island regions, is about to undergo a major transformation. In recent years, ICT environments have begun to be established in educational settings throughout the country. However, it is a fact that there is a large difference in the response to remote learning among local governments. On the other hand, some local governments in Nagasaki Prefecture have begun initiatives to collaborate with private companies and universities to enhance remote learning. In particular, in remote island areas, cross-border collaborative remote learning is being developed in a way that makes use of past experiences. These efforts are expected to meet the needs of the "new normal" under the COVID-19 situation and to be effectively used as "hubs for collaborative learning" that will become the standard in the future. This paper briefly explores the challenges and possibilities of how the promotion of remote learning can bring a ray of hope to the educational field of public schools, using the case of Nagasaki Prefecture, which includes remote island area.

KEYWORDS: Remote Learning, Online Education, COVID-19, Collaborative Learning, Nagasaki

1. INTRODUCTION

Technology is changing the way teachers interact with students at classrooms in their school. The COVID-19 pandemic as unexpected events made it impossible to conduct class within school walls. This situation accelerated existing trends in remote work, automation and online education, than previously estimated potentially needing to switch our lifestyle. This pandemic has challenged many of the ways that school students share knowledge, formally and informally. Face to face discussions are literally difficult under pandemic situation.

Since Japanese government declared a state of emergency in February, 2021 due to the spread of the new coronavirus, the learning environment for students has drastically changed. Measures against the COVID-19 infection have had a major impact on all aspects of our lives, and public schools were no exception. As a measure to prevent the spread of the virus, most elementary, junior high, and high schools, as well as universities in Japan, took measures such as temporary closure of schools, and in some areas, the closure period lasted for over two months, an unprecedented emergency. In this context, remote learning and online education has been attracting more attention as one of the methods to secure learning opportunities for students.

Under these circumstances, schools, boards of education, local governments, and central government agencies have taken various measures to support students' learning during the closed period. This paper focuses on remote learning using ICT in Nagasaki Prefecture (including remote islands area), and discusses the possibilities and future prospects of emerging remote learning. Especially this paper examines remote learning initiatives before the widespread use of COVID-19, and how remote learning has changed and what issues have arisen in the wake of COVID-19, with a particular focus on the response of public high schools in Nagasaki Prefecture, including remote island areas. The research method is based mainly on a literature review, participant observation from online-based study groups and opinion exchanges, and interviews with people involved in education in the Nagasaki Prefecture. For the purpose of this paper, remote learning is considered as learning method that occurs when teachers and students are separated by distance or time, making it impossible to meet in a traditional classroom. When this paper mentioned remote-learning that is utilizing learning technologies to maximize lesson plan and curriculum outside of the physical classroom for both teachers and students.

This paper is organized as follows. Section 2 introduces the brief concept of collaborative learning. Section 3 describes the response to remote learning in the COVID-19 crisis in remote education, and Section 4 and 5 discusses the situation of developing remote learning environment in local municipalities, focusing on leading cases in Nagasaki, including the remote island areas. Finally, Section 6 presents the conclusive remarks.

2. Collaborative Learning and Online Environment

Collaborative learning is based on a new view of academic achievement that is the concurrence of both constructivist approaches to learning, and the development of the Internet has led to the development of a particular form of constructivist teaching, originally called computer-mediated communication (CMC), or networked learning. In today's Internet-enabled online environment, it is often referred to as "online collaborative learning" (OCL) (Harrasim 2012)[1]. OCL builds on and integrates theories that focus on conversational learning, conditions for deep learning, development of academic knowledge, and knowledge construction (Scardamalia and Bereiter, 2006)[2].

Since the very early days of online learning, some teachers have focused on the communicative potential of the Internet. Early discussion over OCL dates back to the 1970s, but the combination of the invention of the World Wide Web, high-speed Internet access, and the development of online remote learning management systems in the 1990s led to their full-scale popularity, and most systems now include an online discussion (Harrasim 2012). Researchers and educators from a wide range of disciplines have been focusing their research on online collaborative learning and communities of inquiry, and there is a certain consensus and agreement on the strategies and design principles that will lead to success. For academic and conceptual development, discussions need to be effectively managed and administered by faculty, and they need to be well supported to enable students to construct new knowledge as they develop their ideas(Salmon, 2000; Bates and Poole, 2003)[3][4].

The role of teachers and schools in this kind of remote learning is not only to facilitate the process and provide appropriate resources, educational content, and learning environments to facilitate this kind of learning, but also as representatives of the knowledge community and subject area, it is considered important to ensure that the core concepts, practices, standards, and principles of the subject area are fully integrated into the learning cycle (Bates, 2019)[5].

Recently in Japan, collaborative learning is based on a new view of academic achievement that is included in the New Courses of Study to be implemented in 2020. It is a method of education that utilizes small groups, in which students work together to maximize their own learning and the learning of others. In the U.S. and other countries, this type of education has been popular for a long time, but in Japan, it has been advocated since around 2011 in the "New Learning (*Atarashii Manabi*)" section of the Learning Innovation Project of the Ministry of Education, Culture, Sports, Science and Technology (MEXT). In this project, new learning is also to be realized through the use of ICT.

(1) Realization of classes that are easy for students to understand
(2) Learning according to the abilities and characteristics of each student (individualized learning)
(3) Collaborative learning where students teach and learn from each other (cooperative learning)

Specifically, it is said that collaborative learning will broaden the scope of learning in situations such as "presentations and discussions", "cooperative organization of opinions", "cooperative production", and "learning that transcends school barriers. In the New Courses of Study, it has been announced that classes will be improved by emphasizing not only "what to learn" but also "how to learn" (Murakami 2020)[6].

In recent years, it is not uncommon to see small classes on remote islands or rural areas in Japan due to the decreased number of students caused by the declining birth rate. Although this is a common sight in remote islands area, it goes without saying that it is not a favourable situation when considering the growth of individuals in a group. In order to overcome this handicap, there have been attempts in various regions, including Nagasaki Prefecture, where there are many remote islands, to connect the main school and branch schools via a video conferencing system. On the other hand, there are many attempts to conduct collaborative learning through exchange with local elementary and junior high schools, which are described on the MEXT website[7]. Through collaborative learning experiences based on interaction with diverse peers, students learn to think for themselves, deepen their understanding of others, and develop critical thinking skills. This paper mainly examines the development and promotion measures for online collaborative learning environments at the local government level. The following section discusses about the current

status and challenges of response to remote learning by extracting practical cases and educational policy approaches of local governments in Japan.

3. Response to Remote Learning:

With the spread of the COVID-19, many countries have implemented emergency plans to slow down and limit the spread of the virus – and address for a possible longer term disruption of school closure and students attendance. Those school closure might give a massive loss in the development of human capital with significant long-term economic and social implications. In a sense, the spread of the virus is a strong stress test for education systems, but it could be an opportunity to rethink existing education systems and to develop alternative education opportunities.

In situations of necessary closure, different forms of online education and educational resources need to be mobilized. The central government and local governments should use existing online remote education courses whenever possible, encourage educational technology companies to make their resources freely available, diversify delivery methods according to age and ability, encourage teacher cooperation, and invest with educational resources. Online remote learning platforms may offer curriculum courses and resources in different digital formats (text, video lectures, etc.). In general, teachers and instructors can select lectures and exercises for students to watch and do, and instruct them through messages and synchronous classes. If such remote education platforms do not exist, open educational resources can be used (OECD 2020)[8].

Even in Japan, the development of new online education platforms is in a developing stage. One of the difficulties with existing resources is that their mass use is not always possible at the same time. Some private platforms have already made their resources and services freely available to some schools in order to expand the response capacity of central and local governments.

According to the MEXT report (April 16, 2020) public elementary schools, junior high schools, high schools, and special support schools provided some form of academic guidance during the temporary closure. Looking at the status of specific efforts, the mainstream was "home learning using textbooks and paper materials," which is the traditional analogue way of supporting learning. On the other hand, "home study using digital textbooks and digital teaching materials" accounted for 29%, "home study using class videos created by the board of education" for 10%, and "home study through simultaneous interactive online instruction" for 5%. Immediately after the government declared a state of emergency, this indicates that only a few public schools provided learning support using ICT [9].

In Japan, before the spread of the COVID-19, the expected role of remote learning was to supplement face to face education. This is because public school education in Japan is based on face-to-face setting, which is based on direct contact between students and teachers, and between students. Under such circumstances, a survey by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) in March 2019 showed that only 22% of municipalities were implementing remote education. The reasons for this include a variety of factors, such as the fact that whether or not to implement remote learning has been left solely up to the educational field, delays in the development of online education, and regulation on implementation.

In 2018, when the MEXT created the "Policy on Measures to Promote Remote Learning", it also stated that it is essential to establish a foundation of human relationships between teachers and students, and among students as a prerequisite for remote learning to be effective. In the fiscal year 2019 supplementary budget, 22 9 .8 billion yen was allocated for

the realization of the GIGA School Initiative. In a nutshell, the GIGA School is "a concept to sustainably realize education that fosters fairness, individual optimization, and creativity at school sites across the country, without leaving any children behind, through the integrated development of one-by-one terminals for students and high-speed, high-capacity communication networks. GIGA stands for “Global and Innovation Gateway for All”. On April 7, 2020, the MEXT Minister Hagiuda announced at a press conference that in response to the declaration of a state of emergency due to the spread of the COVID-19 infection, he would actively promote support for the early realization of the GIGA school concept. In the near future, more and more advanced technologies such as AI and big data will affect the quality of education, and it is expected that the next generation of educational infrastructure, including ICT environments and school facilities that can meet new educational needs, will be enhanced. The concept of GIGA School aims to realize an education that maximizes students' abilities by optimizing individualized learning for each student and allowing them to learn flexibly according to their level of proficiency. To archive this goal, the government initiatives to be promoted will include: (1) integrated development of hardware, such as one digital device per student and a high-capacity, high-speed network; (2) expansion of software, such as digital content and learning activities; and (3) construction of a teaching system that enables students to use ICT on a daily basis (MEXT 2019)[10].

However, in the field of remote learning, there are still many problems in terms of both hardware and software. "The Policy for the Promotion of Remote Education" states that prior to the spread of COVID-19, the following issues were identified as hardware issues in the implementation of remote learning: (1) Inadequate ICT environment and system (2) A lot of time and effort are required to prepare teaching plans and teaching materials. As for software issues, (1) it is difficult for teachers to provide timely and appropriate guidance and evaluation to students, and (2) difficulty to take prompt action in case of unforeseen circumstances. In addition, there are some restrictions on the implementation of remote learning, such as (1) teachers must be assigned on the receiving side for safety management (MEXT’s notice), (2) in principle, remote learning was not treated as attendance and was not reflected in evaluation (compulsory education), and there is an upper limit to the number of credits that can be obtained (high school and university) (School Education Law Enforcement Regulations, etc.), and (3) even for educational purpose, individual permission from the copyright holder is required for the use of online materials, etc. (the former Copyright Law, Article 4), which raised the hurdle for implementing remote learning.

In addition, the current status of ICT environment development in public schools nationwide as of March 2019 is as follows: 5.4 students per educational computer, 41.0% of regular classrooms have wireless LANs, and 70.3% have Internet access of 100 Mbps or higher The current status is as follows In addition, 52.2% of the classrooms were equipped with electronic blackboards, large displays, projectors and other large presentation devices. Looking at the number of students per educational computer at the municipal level, Saga Prefecture had 1.9 students per computer, while Aichi Prefecture had 7.5 students, a huge difference. Furthermore, Shibuya Ward in Tokyo has achieved one unit per person, while Nerima Ward has one unit per 14 people, a large disparity exists even within the same Tokyo metropolitan area.

The prolonged temporary closure of schools due to COVID-19 infections rapidly drew attention to online-based remote learning. What became apparent was the disparity in response to the school closure among regions and schools. The next section looks at how government and municipalities response the situation in use of online educational materials.

4. Use of Online Educational Materials in COVID-19 Crisis

Following the spread use of the COVID-19, the government has been moving forward with the deployment of one digital device per student to flexibly manage the number of class hours for certain subjects. Furthermore, the first supplementary budget for FY2020 includes 229.2 billion yen to implement the deployment of one device per student in public junior high schools until the end of FY2020 (as of the end of February 2021, this has yet).

In the emergency economic measures approved by the Cabinet on April 20, 2020, the items implemented for remote learning include the urgent development of an environment for ICT-based education and a review of the requirements and number of credits for remote learning. The government also planned to support students' home study, such as the development of online curriculum (Table 1). Through these measures, the government aims to ensure that no student is left behind and that learning effect is maximized.

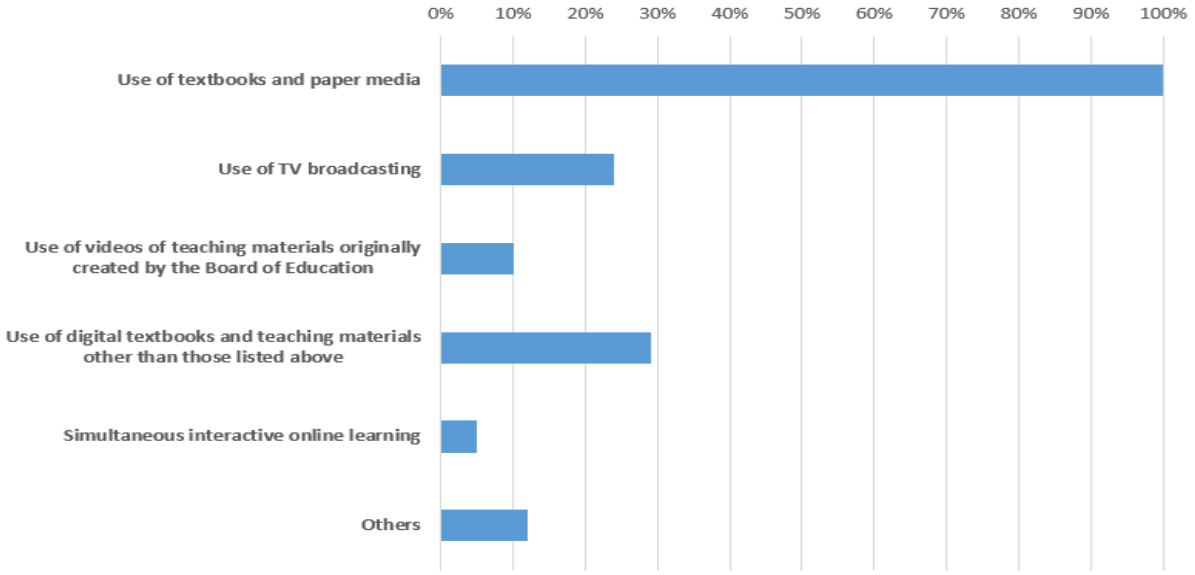
[Table 1] Items Implemented for Remote Learning

1. Prompt Development of ICT Environment
・Provide one digital device per person for elementary and junior high school students, and implement supplementary budget for communication environment. ・Ensure that priority is given to those in need.
2. Review of Requirements for Remote Learning
・The current requirement of "presence of a teacher at the receiving end" will be recognized as an official class even if it is not met. ・Similarly, if the mandatory requirement of "simultaneous interactive" is not met, the class should be recognized as an official class.
3. Relaxation of the Limit on the Number of Credits for Remote Learning
・The maximum number of credits approved for remote learning in high schools and universities is 36 and 60, respectively. ・Flexible measures will be taken to calculate the number of credits for these remote learning courses.
4. Development of Online Curriculums
・Expand online educational content to enable students to study at home
5. Organize Copyright Requirements for Online Learning.
・Immediately enforce the law to amend part of the Copyright Act to make the distribution of digital materials license-free in principle, and to make them available for use upon payment of compensation.

Source: Cabinet Office, "Emergency Economic Countermeasures for New Coronavirus Infections" (April, 2020)

However, according to the report released by MEXT on April 16, 2020, only 29% of local governments that have temporarily closed schools were using online learning materials for instruction. Only 5% of respondents were using the "simultaneous interactive" type of online instruction, which is similar to face-to-face instruction but lectures in real time, and both the teacher and students can communicate with each other [Figure 1]. Even after the outbreak of COVID-19, more time is needed to improve remote learning system.

[Figure 1] Status of Home Study during Temporary School Closure (N=1,213)



Source: MEXT (2020) "Status of Efforts for Learning Guidance at Public Schools in Relation to Temporary Closure of Schools for Countermeasures against COVID-19 Infections"

Here, I would like to introduce some examples of ICT-based remote learning initiatives in elementary, junior high, and senior high schools. For example, Kumamoto City became one of the first cities in Japan to implement remote learning in all public schools within the city. Kumamoto City started to improve the ICT environment in the education field in 2018, and has introduced more than 23,000 LTE model tablet terminals (Ando 2020)[11]. The maintenance rate of the terminals is equivalent to one terminal for every three students. All elementary schools will start using the terminals in FY2019, and junior high schools were planned to start using the terminals in FY2020. In the midst of this situation, the City also started temporary school closures on March 2, 2020, and they were extended to the new school year and even to May, so the city's Board of Education decided to introduce remote learning at all elementary and junior high schools. However, there were not enough tablets to lend to all the students for the introduction. Therefore, during the spring vacation, a questionnaire survey was conducted to ascertain the status of the ICT environment at students' home, and LTE model tablets that had been installed at the school were loaned to families that did not have an ICT environment, so that all students could participate in remote classes.

On the other hand, to support teachers who actually conduct remote learning, they prepared a manual for practicing remote learning, presented model classes, and provided information and training on how to tackle the issue step by step. After these preparations, all public schools in Kumamoto City started remote learning early in April. So, what did they actually do? The following is a list of ICT-based remote education programs that have been implemented nationwide, including in Kumamoto City (see Table 2). From these examples, we can point out the following two characteristics of remote learning in public schools. The first is that remote learning in public schools to video distribution of lessons, but actively engages in activities that take advantage of the interactivity of ICT. The second is that remote education is used for a wide range of purposes. The second is that remote education is used for a wide range of purposes, from morning meetings, classes, homework, after-school club activities, and even health care and mental support [12].

[Table 2] Online Educational Contents during the COVID-19 Pandemic

Activities	Outline
Online Homeroom	Teachers check on students' home study progress, announce online career counselling, etc., and explain and respond to each student's recent situation.
Health Care Records	Students will be able to use ICT devices to input and transmit their temperature and physical condition to help them manage their health.
Video Lessons	Use video distribution services to deliver video lessons. In some cases, the boards of education of each municipality have created the videos, and in other cases, they have collaborated with local TV stations and cable TV stations to create the video lessons.
Live Interactive Classes	Using zoom, etc., live delivery similar to regular classes will be conducted using the raise hand function, screen sharing function, and chat function.
Collaborative Learning	Students will share the information created by each person in groups using the collaborative learning support tool, and then present the information. The group function of the video conference system will be used for discussion.
Assigning and Extracting Learning Tasks	Give assignments such as reports using the video conference system and express what they have learned using ICT devices
Study Records	A reflective record of what the students have done in their daily (at home) remote learning and their impressions will be filled in by the students and submitted to the teachers. This is useful for understanding the progress of learning and reflecting on the class.
Use of Digital Learning Contents	Support home learning by using teaching materials available on ICT devices, video lesson services, etc.
Online Learning Consultation	Online guidance on study content that help students to get better understanding in their home study, using a video conference system
Online consultation for problems	Provide opportunities to discuss problems and concerns during the COVID-19 self-restraint using SNS and video conference systems.

Source: Cabinet Office “Emergency Economic Countermeasures for the COVID-19 Infections” (April 7, 2020)

5. Challenges of Remote Learning Development in Public Schools of Nagasaki

Currently, ICT in education is progressing at a rapid pace. At the elementary and junior high school level, the ‘Global and Innovation Gateway for All (GIGA) School Concept’ has been proposed, in which one educational computer is distributed to each student and a high-speed in-school network environment is provided to promote the development the ICT environment in public school by the end of March 2023[13]. The GIGA School Initiative aims to correct this disparity and promote the next generation of learning by allowing everyone to use ICT devices. The government is accelerating its efforts ahead of planned schedule, coinciding with the increased need for online classes due to the effects of the COVID-19. The year 2020 also marks the "dawn of digital education" from various perspectives, as programming education became compulsory in elementary schools from the year 2020.

Of course, ICT environments have been developed at educational sites across the country in the past. However, it is a fact that there has been a lack of impartiality due to the great difference in response among local governments. According to the "Survey on the Actual Status of the Computerization of Education in Schools (Summary)" conducted by the MEXT, the number of students per educational computer in Saga Prefecture, which ranks the first, is 1.9 students per computer, while that in Aichi Prefecture, which ranks last, is 7.5 students per computer, a four-fold difference (as of March 2019)[14].

The number of children and students in Nagasaki Prefecture has been decreasing for a long period of time due to the declining birth rate, and it is an important to ensure a sustainable educational environment, including in remote island areas where the depopulation is more pronounced than in the mainland. In the midst of this disparity, for example, Kawatana Town in Nagasaki Prefecture, is a leading example of ICT in education. Kawatana is a small town with a population of less than 14,000, but in the "Public School

Informatization Ranking 2019" by Nikkei BP, the town ranked 28th in Japan out of more than 1,700 municipalities [15]. Nagasaki City, the prefectural capital and the most populated city in the prefecture, is ranked 222nd, and Sasebo City, the second largest city adjacent to Nagasaki City, is ranked 308th (see Table 3).

Considering this situation, it can be said that Kawatana Town has a blessed ICT environment [16]. The Town of Kawatana, in cooperation with Panasonic, a major electronics manufacturer, has introduced the system as an infrastructure for online education, and The MEXT-led initiative to introduce ICT into the educational environment has become more important with the COVID-19 disaster. For example, in high school level, there are plans to install one large display unit in each classroom by 2022, and the Board of Education of Kawatana Town has decided to install fifty five electronic blackboards for strengthening remote learning system. Thus, it is expected to be effectively used as a hub for collaborative learning, which will become the standard in the future [17]. On the other side, Kawatana Town has supported the development of ICT in education, but there are teachers who are not good at ICT. The key to future efforts would be how to lower the hurdle of operation for those teachers who are uncomfortable with it.

[Table 3] Public Schools Informatization Ranking in Nagasaki (2019)

Municipality	Overall Rank.	Infrastructure Rank.
Nagasaki Prefecture	-	-
Nagasaki City	222	197
Sasebo City	308	206
Shimabara City	1383	1403
Isahaya City	1414	1465
Omura City	539	487
Hirado City	647	616
Matsuura City	1175	1192
Tsuhima City	1422	1433
Iki City	743	737
Goto City	195	176
Saikai City	438	376
Unzen City	526	472
Minami Shimabara City	1046	373
Nagayo Town	425	482
Higashisonogi Town	127	87
Togitsu Town	534	482
Kawatana Town	**28**	**15**
Hasami Town	1072	1073
Ojika Town	214	14
Saza Town	214	186
Shin Kamigoto Town	1544	1588

Source: Adapted from Nikkei BP “Public Schools Informatization Ranking 2019”
Note: The number of municipalities surveyed was 1739 for the elementary school, 1776 for the middle school, and 47 for the high school. Grey shading represents remote island municipalities

Next, this paper explores the situation in the remote island areas of Nagasaki Prefecture, which has the most remote island municipalities in Japan. The term "remote islands" here refers to "islands in the sea far away from land”. In recent years, islands close to the mainland (inland areas) have tended to be connected by bridges, but in this paper, the term "remote islands" is used only for islands that are not connected by bridges and must be travelled to by boat or airplane.

The remote island areas of Nagasaki have historically played an important role in maintaining international exchange (trade, exchange, and cooperation), and thus possess a great deal of historical heritage and natural environment. However, due to the development of the world economy (transportation systems, etc.), the role of these islands has declined, and these islands are facing major social problems such as declining employment and population, and incomplete public services (health care, education services, etc.), which make life inconvenient and unsustainable for the islanders. Local governments in island countries are encouraged to implement policies to solve the problems in order to maintain the culture, society, and economic growth of the islands (Okuyama and Ishihara, 2015)[18]. However, local governments in island area cannot implement expensive public projects to solve problems because of severe financial constraints.

Of course, in the educational environment, island municipalities have been making efforts in remote education from early on. As will be discussed later, some island municipalities have developed educational environments not only in Nagasaki Prefecture but also in remote islands and overseas. Previous descriptive and quantitative studies have shown remote learning in islands during peacetime, but there have been few studies analyzing the current status and issues of the efforts under the COVID-19 crisis situation. This paper attempts to analyse these aspects in the islands. As described above, all islands in the world have common problems, and the results of this paper will contribute to the improvement of services in the educational environment of other islands.

In areas where there are many remote islands, it is common for residents of remote islands who wish to pursue higher education to use remote learning at universities. In remote island areas, there are several universities and their satellite offices (e.g., Cyber University) that are completely on the Internet, and the Open University of Japan also provides education through television (BS) and radio broadcasts and streaming via the Internet. In the case of the Open University of Japan, for example, there are Learning Centers all over the country, where face-to-face education is also provided, though in fewer numbers. In some cases, examinations are held face-to-face at learning centers called satellites or branches. In other words, students of the Open University of Japan who live in remote islands can take classes every day in their place of residence, but they must travel to study centers (or satellites or branches) to take interview classes and credit approval exams. In this respect, students living in remote islands have to bear the burden of costs and time that students living in other areas do not have. As an extreme example, a student living in Ogasawara in Okinawa Prefecture may have to travel almost 30 hours one way by boat and then by train, costing almost 30,000 yen each way. With an airplane, the time is reduced, but as with a ship, the flight may be cancelled due to typhoons or other natural conditions, and the student may not be able to take the exam. Thus, in remote island areas, access to educational infrastructure and transportation can be more difficult than on the mainland. The remote islands of Nagasaki are no exception to this situation.

In response to the difficulties in transportation access due to the geographical environment, ICT in education has been promoted in Nagasaki Prefecture since before the COVID-19 epidemic, with the aim of improving students' academic performance and eliminating geographical burdens such as remote island education. In elementary, junior high, and prefectural schools, electronic blackboards, tablet PCs, and digital textbooks have been installed as part of the ICT education promotion project. In addition, five public schools in remote island areas, and 12 elementary and junior high schools have been designated as the model schools for promoting ICT education. These schools highly engages practical research on effective learning styles [19]. In addition, in order to enhance the teaching in remote islands by using the remote class system, we have set up a system for conducting remote classes through interactive communication in 18 locations in the prefecture.

While school has been closed due to the spread of the COVID-19, for example, Tsushima Prefectural High School has been working on remote learning. One of the features of this project is that the know-how gained from the lessons conducted under an agreement with a university outside of the island could be applied to the lessons during the school closure. In Tsushima City, Korean instructors are conducting interactive education such as Korean language classes by using remote learning tools such as tablet PCs and Zoom. In addition, the high school has adopted the "Study Abroad Program in Remote Islands" (SAPRI) from inside and outside of the prefecture.

Nagasaki has many remote islands blessed with rich nature. In 2003, the five prefectural high schools introduced RISP for high school students to enable them to study in the environment of these islands, and it has been the first in Japan to recruit students from both inside and outside of Nagasaki Prefecture. SAPRI is available at five schools: Tsushima High School, Iki High School, Goto High School, Goto Minami High School, and Naruru High School. This program offers specialized courses such as Korean, Chinese language, history, sports courses. These are curriculums unique to the remote island region that aims to develop the characteristics of students with a sense of purpose and motivation [20].

The SAPRI students were also affected during the temporary closure of schools due to COVID-19, forcing students from outside the island to return their hometown. Since April 2020, many high schools in Nagasaki Prefecture have resumed school on April 8. However, in Tsushima, for example, students from outside the island had to stay in student dormitories or hotels for two weeks for quarantine purposes, as it was judged that medical care on the island would be affected in the event of an infected person. Students were not able to attend school together until April 20, later than other schools (The reopening of schools was delayed, but soon after, the government declared a state of emergency and the schools were temporarily closed again from April 22).

Although the school closure period was extended as mentioned above, there were situations in which the remote island areas were able to make use of the know-how of remote learning. Some high schools in remote island region, including Tsushima High School, have been designated by the MEXT as research schools for remote learning systems, and have been practicing classes collaborating with Ritsumeikan Asia Pacific University and Pukyong National University in Busan, South Korea. Even when the school is temporarily closed, the school conducts remote learning in collaboration with universities (Nagasaki Prefectural Board of Education) [21]. In addition to classes, they have also held consultation sessions via Zoom application with the parents for students care. On the night of April 17, when Nagasaki Prefecture announced that classes would be cancelled, about 90% of parents participated in the online consultation sessions. Such a quick response can be attributed to the success of the remote learning experiences that had been in place before the pandemic.

In terms of collaborative learning environment, high schools in island regions are also seeing cross-border educational cooperation by connecting with neighboring Korea, as in the case of Tsushima. In addition, Tsushima is opening an online-based citizen's course called the "Tsushima Glocal University"（https://tsushimaglocal-u.com/）at the end of September 2020 to learn about the nature and culture of the island region and the future of remote islands. The contents are designed in collaboration with university researchers and museum curators. These efforts are beyond the scope of public schools and represent a new challenge that has the potential to deepen connections between students and the local community in a declining population. The collaboration with Korean schools and students in Tsushima City's public schools, for example, allows students to learn together with students from overseas while staying in Japan. Such cross-border educational cooperation can be called "collaborative online international learning" (COIL) (Ikeda 2016) [22].

Since the COVID-19 pandemic has made it difficult for people to visit the island, this citizen's course is changing policy to have all lectures online. This course is open to high school students and above, and students are required to take several lectures and online seminars over a period of six months and submit reports to complete the course. As of the start of the course, more than 120 people have already applied from inside and outside of the island. With the spread of COVID-19, the program has become available not only to public school students, but also to people on and off the island. It is hoped that this will lead to a learning environment where islanders and off-islanders can learn new ideas from each other through online, and develop through connection.

According to an interview by the Asahi Shimbun, Kotaro Tagawa, Principal of Tsushima High School reflected that "Zoom has enabled us to have interactive classes and send out information". On the other hand, he pointed out that "the challenge is to deal with students who don't have smartphones and families who cannot send and receive large amounts of data over the Internet. He added, "Only after we clear these issues we will be able to provide classes in accordance with the curriculum to all students. I wish that the prefecture and the central government will take this opportunity to create a communication environment that guarantees the right to learn. I hope that the prefectural and national governments will take this opportunity to create a communication environment that guarantees students' right to learn" [23]. Although this is an another private school case, on a remote island other than Tsushima, N High School, a correspondence private high school run by Kadokawa Dwango, is collaborating with Goto City to develop a virtual and real work experience program from 2019. These activities are currently restricted by the pandemic situation, however, some local governments are steadily preparing social project-based education programs that combine online educational content with real-life experiences in remote islands [24].

In the remote island region of Nagasaki, it was confirmed that there has been a certain degree of accumulation of collaborative learning through remote learning before the COVID-19 pandemic. Based on these experiences, they will be required to further respond to digitalization.

6. Conclusive Remarks: Challenges and Opportunities

This paper briefly explored that the collaboration between the public and private sectors, as seen in Kawatana Town, and the utilization of the know-how on remote learning in remote islands that has been accumulated since before COVID-19, is being utilized in collaborative learning through remote learning in COVID-19 disaster. However, there is still a large disparity in the ICT infrastructure environment among local governments, and the effectiveness of remote learning may be reduced if students do not have the technical support and environment to learn comfortably at school or home. Particularly in rural areas and remote island regions, it may cost a large amount of money to establish an Internet environment. If students and families cannot afford to pay for it, they will not be able to access learning resources.

In some cases, students have personal and family problems accessing tools and learning resources, while in other cases, the lack of technical support has been a challenge because faculty members are busy with infection control and not all are necessarily familiar with developing ICT-based educational programs. The rapid change in learning styles from face-to-face to online (or on-demand) after the COVID-19 pandemic may have caused stress to the staff working in the field. One of the reasons for the lack of support from local governments may be not only financial issues, but also limited knowledge and capacity to make the best use of learning and teaching resources in remote areas.

The COVID-19 pandemic presents a major challenge to the field of education, but also an opportunity for us to explore new ways of education for rural and remote island areas with rapidly declining populations. In other words, with creativity, flexibility, and intentional planning, it is possible to enhance collaborative learning, whether face-to-face, online, or with EdTech. Again, as long as COVID-19 exists, the biggest challenge is resource constraints. Remote learning requires technical resources and innovative idea that are costly to procure and maintain.

In Nagasaki Prefecture, as seen in Kawatana Town and Tsushima City, the situation is not as disadvantageous as expected, and there is a need for efficient use of the resources and know-how of local governments and communities that manage public schools, including collaboration with the private sector and development of transnational educational programs. This can be an opportunity. Community-based public schools should be resilient enough to withstand any disaster. By improving cross-sector collaboration in the paradigm shift to effective education in remote areas, public schools will be able to survive COVID-19.

Some of the common challenges that public schools are facing in COVID-19 in various parts of Japan may include financial difficulties, lack of IT knowledge and expertise, and difficulties in developing online learning materials. However, in conclusion, we should not ignore the possibility that these situations can be alleviated in this COVID-19.

Local public schools are expected to play a more effective role in providing educational opportunities for students. Schools may need to establish ways to help students continue their learning and avoid failure. For example, they could ask graduates or private sectors that already have a track record in industry-academia collaboration to provide guidance to help students learn, especially those who are not used to remote learning. Particularly in depopulated areas, it is important to establish a system that facilitates the participation of not only students and school teachers, but also all parties involved; in the wake of the COVID-19 pandemic, it will be essential to create new system that takes into account the current trends in order to enhance more inclusive education in depopulated areas and remote islands.

This paper deals with the trends and issues in remote learning, but was not able to sufficiently examine the correlation between the improvement of the learning environment by local government educational policies and the actual educational effects on students. This will be the subject of future research.

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