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Case Studies of DRR (Disaster Risk Reduction) Delivery Lessons Using ICT in Elementary School Classroom in Japan – Lessons from COVID-19 to Future Practices

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Abstract

The COVID-19 pandemic made it difficult to conduct the face-to-face contact-based DRR (disaster risk reduction) delivery lesson we had been giving in an elementary school. To overcome this challenge, we developed a video tool and practiced delivery lessons by using ICT in schools. This paper reports on three cases. In study 1, we conducted a delivery lesson by connecting the school broadcasting room to the classroom in a one-way manner. In study 2, we practiced with connecting the laboratory in a university to individual student's computers. In study 3, we visited the school and carried out the practice in connecting the school computer room with the classroom teacher's computer in classroom. We summarized the differences among these three practices, as well as their various characteristics, and discussed the future directions of ICT-based DRR delivery lessons. The ICT-based DRR delivery lesson could bring new educational effects that have never been generated by the traditional delivery lessons.

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1 Introduction

1.1 DRR Delivery Lessons after the Great East Japan Earthquake

Many people were lost in the Great East Japan Earthquake on March 11th, 2011. 15,899 people died and 2,526 people remain missing in the past 10 years (National Police Agency, 2021). The disaster triggered a movement to enhance disaster risk reduction (DRR) and its education. Not only structural measures (e.g., building a tsunami wall), but also non-structural measures (e.g., developing people's attitude and knowledge) is very important.

We have conducted DRR delivery lessons (composed of a lecture, a group activity and a summarization) at elementary schools in Japan (Tohoku University, 2016), mainly in Miyagi Prefecture, and all over the world (e.g., Thailand, Indonesia, and United States of America) since 2014 (called YUI project). The lesson is held in a classroom for a small school, and it is given in a large place such as a gymnasium or assembly (generally in a gymnasium) hall for a large school, according to the size of the school. The lesson takes about 90 minutes. We have visited about 300 schools and have given DRR delivery lessons to about 17,000 children. One of the challenges is to continually provide the DRR delivery lessons to the children forever and ever.

However, due to the COVID-19 pandemic, we could hardly conduct the visiting schools from April 2020 to March 2021. As opposed to regular school classes, delivery lessons by an external lecturer were seriously limited for avoiding unnecessary physical contact at all costs. The number of the DRR delivery lessons given last year (April 2020 – March 2021) was only five schools (As a reference, we provide delivery lessons for about thirty to forty schools in a typical year).

In order to resolve this matter, we have designed a video that can be used in classes and trainings for DRR. From April 2021 to the present, we carried out the delivering lessons with utilizing the video ICT in schools. These practices help to decrease the amount of unintentional contact.

1.2 COVID-19 Pandemic and School Education in Japan

With the pandemic of COVID-19, schools have been forced to adopt a new lifestyle. Japan is no exception (Iwabuchi et al., 2021). For the past two years, schools have been taking various approaches to prevent the spread of the disease, depending on the number of infected people. When the number of infected people increased, the schools took appropriate countermeasures, such as dispersed school attendance and online classes. When the number of infected people has settled down, students can go to school, but group work in classes has been refrained from, they have been forced to eat in silent at lunch time, and visitors other than teachers and students have been restricted from coming into the school.

As it happened at the same time, the GIGA (global and innovation gateway for all) school project, i.e., the establishment of one computer per student and a high-speed network environment, has progressed in Japan (MEXT, 2020a). In the COVID-19 pandemic, as the project were carried out ahead of the schedule in order not to stop the students learning (MEXT, 2020b). With the implementation by the government and its new educational methodologies under the COVID-19 pandemic, new educational strategies were explored, and superior practices were developed that should be continued in the after COVID-19 period. It would be meaningful to share these practices with society at large, to use them as a reference for other teacher's practices, and to share the challenges of these practices with many teachers in order to pursue better education in the future. The practice of applying ICT in the COVID-19 pandemic, which should be shared with society, is not limited by teachers in elementary and junior high schools but should also include teachers from third organizations (e.g., delivery lessons by researchers). Our practices of DRR delivery lessons would be one of them.

1.3 Purpose of Study

This paper reports our DRR delivery lessons in elementary schools using ICT under the COVID-19 pandemic and provide applicable insights for the future DRR delivery lessons in the after COVID-19 period. In the following section, we will give an overview of the video, report on our practice of using the video (three cases), and finally discuss the future directions.

2 Materials

2.1 Video

Starting time	Video chapter name	Details
02:30	Introduction	Introduction of the anime characters and explanation of the concept of disaster risk reduction (DRR)
03:40	Geographical characteristics of Japan	Explanation of the nature of the earth, the geographic features of Japan, and earthquake hazards
06:17	Tsunami mechanism	Explanation of past tsunamis in Japan and the Great East Japan Earthquake
11:03	Earthquake mechanism	Description of the features of damage caused by inland earthquakes
12:15	Preparedness for earthquakes	Highlighting examples of earthquake preparedness
13:23	Torrential rain mechanism	Describing the mechanism and examples of heavy rainstorm damage
18:51	Preparedness on a regular basis	Summarizing preparedness actions for future natural disasters
19:18	Evacuation behavior	Summarizing the details of evacuation actions
20:21	Summary	Summarizing the story and important points

Table 1: Overview of the video

Figure 1: Screenshots from video

Note. Experiment movie for comparing a wave and tsunami (left), simulation of tsunami coming to Japan (middle), and quiz time (right).

The video (Yasuda, Saito, & Muramoto, 2021a) is based on the lecture of the delivery lesson we conducted (Yasuda, Muramoto, & Nouchi, 2018; Yasuda, Saito, & Muramoto, 2021). Real movie and animation are mixed in the video (Figure 1). It includes experimental clips and simulation clips on natural disasters (Moriguchi, Okawara, & Kure, 2018; Shuto, Imamura, Koshimura, Satake & Matsutomi, 2007; Tsunami Research Subcommittee in Japan Society of Civil Engineers, 2009), and quizzes are questioned by a lecturer, and three animated characters (Mari-sensei as a science

communicator, Yui-hime [Princess], and Saizo [Ninjya]) appear to interact with each other. The detailed contents of the video are shown in Table 1. The length of the video is about 22 minutes.

2.2 Worksheet

The worksheet that uses after watching the movie, contains three questions. "*What have you learned from the video?*," "*What will you talk and teach to your parents?*," and "*What will you teach to little children?*." The questions help students to reflect what they learned and to develop disaster knowledge and attitude.

3 Case Studies

In this section, we present the practice of using the video in three schools since April 2021. A questionnaire on DRR knowledge and attitudes was conducted before and after these practices, but we will not report because the questionnaire study has nothing related to the goal of this study (to ethnographically analyze and report on the practice of disaster risk reduction delivery lessons).

3.1 Study 1

3.1.1. Students and Teachers

There were eighty-one 4th grade students, one-hundred ten 5th grade students, and one-hundred twelve 6th grade students (3 classes per grade). Each class had one teacher.

Figure 2: The scene of practice in Study 1

Note. The lecturer is sitting in the broadcasting room and speaking to the camera (left), and a classroom teacher is writing on the blackboard (right).

3.1.2. Practice

This practice took place in April 2021. This practice was 45 minutes long. Two practices were conducted, one with 4th and 5th graders and the other with 6th graders. The school did not have a sufficient Internet infrastructure. Accordingly, we used the existing system in the school, which connects the TV set (or screen) in each classroom with the broadcasting room. This system also had a switcher function. With this switcher, for example, we could send the images being taken by the video camera placed in the broadcasting room and the images played on the DVD player to the TV set (or

screen) in each classroom, and we could switch freely between them. The system is sometimes used for greetings by the school principal.

Before the class started, the school principal introduced the lecturer to the children via video camera. The lecturer then explained the purpose of this study to the children, also via video camera. Students sat in their own desks in each classroom and watched the video streamed from a TV set (or screen) at the front of the classroom. The video was played from beginning to end without being stopped. The class teacher wrote down the keywords and expressions in the video on the blackboard. After watching the video, the lecturer instructed the students on how to reflect about what they had learned. The class teacher gave each student a piece of worksheet to write on for reflection. During this process, the lecturer left the broadcasting room and went to each classroom for an observation of students reflecting on their own learning. After this observation walk, the lecturer returned to the broadcasting room and introduced orally the student's written notes that had been picked up from the classroom observation, in order to share them with the entire students. At the end of the lesson, the instructor gave a greeting, and the teacher also gave a closing speech in the classroom, and so the lesson ended.

3.2 Study 2

3.2.1. Students and Teachers

There were twenty-eight fourth grade students (one class). Class had two teachers (i.e., a classroom teacher and the vice principal). Twenty-seven students participated from the classroom and one student from the nurse's room, because the student had difficulty in participating in the classroom. In Japan, this approach is allowed for children with some challenges (MEXT, 2011).

Figure 3: The scene of practice in Study 2

Note. Students are raising hand for answering a question (left), and a student is taking a note with watching the video (right).

3.2.2. Practice

This practice took place in September 2021. The lesson time was 45 minutes. The school had a sufficient Internet infrastructure, and each student can use his or her own tablet in regular classes. Given this situation, we decided to practice using Google Meet (Google, 2021), which is frequently used in online lessons, following the meeting with the teachers. Note that the camera was turned on and the microphone was turned off on the tablets used by the students. In the Google Meet, the teachers

informed the students in advance not to touch and operate the screen without permission in order to prohibit the learners from behaving in a selfish manner.

The lecturer accessed the Google Meet from the laboratory of the university as a collaborative host (the other host was the homeroom teacher). At the same time, the teacher set up a laptop computer in front of the blackboard in the classroom and accessed the Google Meet on the laptop to communicate with the lecturer. Each student individually accessed the Google Meet on his or her own tablet device and watched the video via a shared browser (YouTube private link). There were three "Thinking Time (time to think about a specific question)" and "Concluding Summary" sections in the video. The instructor paused the video in order to give the students a question according to each of the video's questions, and then asked the questions to the students in the classroom. The students who wanted to answer the questions were required to raise their hands on their own, instead of using the raising button on the Google Meet. One or two of the children were selected for each question by the lecturer. The selected students then stood near the teacher's laptop in front of the blackboard and answered the questions to the lecturer. After watching the video, the classroom teachers distributed the worksheets to the students to summarize what they learned from the watching the video. The students worked on the worksheet one by one. Afterwards, the students who wanted to answer questions on the worksheet had to give their speeches in the same manner as the questions and answers in the previous section. The lesson was concluded with a thank you and closing remarks.

3.3 Study 3

3.3.1. Students and Teachers

There were one hundred forty-eight 4th grade students (4 classes) and 10 special treated students (2 classes). Each class had one teacher.

Figure 4: The scene of practice in Study 3

Note. Students are watching the video (left), and one student are standing and presenting what he learned from the lesson (right).

3.3.2. Practice

This practice took place in October 2021. The practice lasted 45 minutes in total. The lecturer launched Google Meet on a computer in the computer room, which is independent from the classroom, and became the host. The screen of the host was then shared on the laptops of the classroom teachers in each classroom, and the computer screen was projected on the screen at the front of the classroom. The students watched the video projected on the screen all together (we used the YouTube private link

same as in study 2). The instructor's screen was tiled with the names of the classroom teachers in each classroom and the situation in each classroom. Like Study 2, the lecturer stopped the video at each of the three places in the video for "Thinking Time" and "Concluding Summary". For each of the pauses, the lecturer asked for any student wishing to share his or her answer to the question, and those who wished to do so raised their hands for a response. At this moment, the lecturer appointed a picky student in each classroom and asked the student to present the answer (e.g., the student with the red hoodie in the class A). The student presenters stood near the teacher's laptop computer in front of the blackboard and presented to the lecturer on the screen. After watching the video, the classroom teacher distributed the worksheet for each student to summarize what he or she had learned from the video. Learners individually wrote about their learning on the sheets. After that, the students gave a presentation of what they had summarized on their worksheets, as well as the instructor's nomination and the selected student's presentation during the video playing. That is, students who wished to make a presentation to the whole class were invited by the instructor, and those who wished to do so raised their hands. At this moment, the external lecturer appointed a certain student in each classroom and asked him or her to present to the audience. The student standing near the teacher's laptop in front of the blackboard made a presentation to the lecturer projected on the screen. This interaction (video and audio) was also projected onto the screens of the other classes. One student was selected as a presenter for each class (children from special needs classes also gave presentations). Finally, the lecturer gave a closing remark, and the classroom teachers and children thanked the lecturer.

4 Discussion and Future Directions

In this paper, we reported on three different practices using ICT in schools under COVID-19 pandemic. In Study 1, the lecturer went to the school, stayed in the school broadcasting room, and then linked the room to the TV set in every classroom. In Study 2, the lecturer conducted the practice by linking the laboratory to the school instead of going to the school. In Study 3, the lecturer visited the school and practiced from the computer room connected to individual classrooms.

In Study 1, although we were not able to practice using one computer per person and a network, we practiced by using the existing system in the school with preventing infection. In Study 2, we conducted the practice by using one computer per person and a network. One of the features of this practice is that it allowed for bidirectional communication. Another feature of this practice is that students who are not usually able to study in the classroom were able to study with the other students in the classroom from the nurse's room. This kind of possibility for students who have difficulty being in a classroom to study together with other students might be regarded as a new approach to studying in the digital age. A similar idea is expected in current discussions on educational practices in networked classrooms. Specifically, it had been assumed that this type of practice would be used for students who needed support for the treatment of illness (NISE, 2021). In Study 3, multiple classes did not have to gather in a gymnasium, as they did in the past, but were able to take the delivery lessons in their own classrooms. In the case of the gymnasium assembly approach used in the past, there were problems with maintaining the concentration of the students seated in the very back. In contrast, the decline in the level of attention and concentration was reduced by the practice of connecting each class to the network, as shown in Study 3. In addition, the teachers of each class were only passively listening to the lecturer's talk in the practice in the gymnasium so far, but in this practice, the teachers played a role of writing keywords and important contents on the blackboard in order to ensure and deepen the students' understanding. This approach of providing delivery lessons to each class using a network has the potential to greatly advance existing delivery lesson methods.

Finally, we discuss the limitations and future directions of this study. In this study, we reported three practices as a case study. It would be helpful to summarize these cases from specific viewpoints (e.g.,

the interactivity between the lecturer and the children, lecturer walking between children's desks [Kikan-Shidou], controlling the video used in the lecture, assistant behaviors of teachers in classrooms), allowing us to draw a more systematic picture of features of each practice. This sort of classification will be useful for specifying the factors to be considered in future similar delivery lessons, and for identifying the advantages and drawbacks.

Second, only three cases were reported in this study, which may be not sufficient to provide a generalized model of a network-based delivery lesson. Since the infection status of COVID-19 has settled down in Japan (November 2021), schools tend to mainly request face-to-face, that is, conventional style delivery lessons. However, as previously mentioned, there are a number of good reasons for using ICT in delivery lessons that may provide a better effect than the face-to-face approach. Therefore, we will encourage ICT-based delivery lessons and provide more instances in the future.

At last, we were only able to digitize the instructor's lecture in this study. However, the delivery lesson includes not only lecture but also group work (See more detail: Yasuda et al., 2018, 2021a, 2021b). The digitization of the group work has not been developed yet. In the future, we will study how to implement group work using ICT and build a model for advanced lessons.

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