Activity Report

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Report on Jamaica Online Volunteer Activity: As a Training for Primary School Teachers, Coordinated by Naruto University of Education and Ministry of Education, Youth and Information

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1. Background

Naruto University of Education (NUE) has an agreement with Japan International Cooperation Agency (JICA) regarding the dispatch of short-term volunteers. The dispatch started in 2016, and so far, it has dispatched three short-term volunteers almost every year and one long-term volunteer according to the needs to support Jamaica's mathematics education in primary schools. Since the dispatch of volunteers to the country was cancelled in 2020 and 2021, due to the COVID-19 pandemic. The Ministry of Education, Youth and Information (MoEYI) and the university have discussed and agreed to implement in 2021, an online volunteer activity coordinated by these two organizations to provide training for primary school teachers of Jamaica with respect to mathematics education. The present report is about this activity.

2. Outline and Schedule of the Activity

This activity consists of 6 sessions as Table 1 shows:

Table 1. Contents and Schedule of the Online Volunteer Activity

No.	Date	Contents	Lecturers
1	Sep. 21st	Japanese Style of Mathematics Lesson and Textbook	Hiroki ISHIZAKA (Prof.)
2	Sep. 21st	How to USE (Teach) Metacognitive Skills for Solving Complex, Unfamiliar and Non-routine (CUN) Task	Satoshi KUSAKA (Prof.)
3	Sep. 22nd	Materials and Activities for Number and Calculations	Soh NAGAKURA, Yuki OCHIAI, Daisuke KANO, Homare TOKIWA
4	Sep. 22nd	Materials and Activities for Geometry	Reiko IWAI, Yuki ONO, Takumi FUJITO
5	Sep. 23rd	A New Approach for Calculation Time Activities for the Inquiry Based Learning (IBL)	Sheena SUCKOO
6	Sep. 23rd	Materials and Activities for Measurement	Madoka SAKO, Nanako SHIGEMOTO, Yusuke WAKITA

Preparations for the online volunteer activity began in May, 2021. Volunteers were recruited in May (10 Japanese graduate school students were selected and 2 professors and 1 Jamaican student joined it), and preparatory meetings were held five times from June to August, 2021. Two of them were conducted online among the MoEYI and the university, and JICA. The volunteers and members of the activity tried to introduce teaching materials and teaching methods for mathematics education that match the contents of Jamaica's new curriculum and academic ability test. They tried to meet local needs while consulting

with the Jamaican student and staff of MoEYI. JICA also facilitated a website to upload and download presentation documents for the activity.

3. Contents of Activities

3.1. Topic: Japanese Style of Mathematics Lesson and Textbook

3.1.1. Objectives

The objective of this session is to introduce the Japanese style of mathematics lesson and textbooks to Jamaican teachers for them to understand the contents knowledge and pedagogical contents knowledge behind the way of teaching or materials. It is not intended to make Jamaican teachers apply the Japanese style to their mathematics education, rather, to have a chance to review their way of teaching and prepared materials, referring to the style of another country.

3.1.2. Contents and Activities

The lecturer first of all picked up some key words to describe the Japanese style of mathematics lesson, such as understanding each child, simplification of mathematics lesson, application of children's words and speaking, real meaning of group work, etc. Then, the lecturer explained how one mathematics lesson is practically organized and how this lesson is theoretically interpreted.

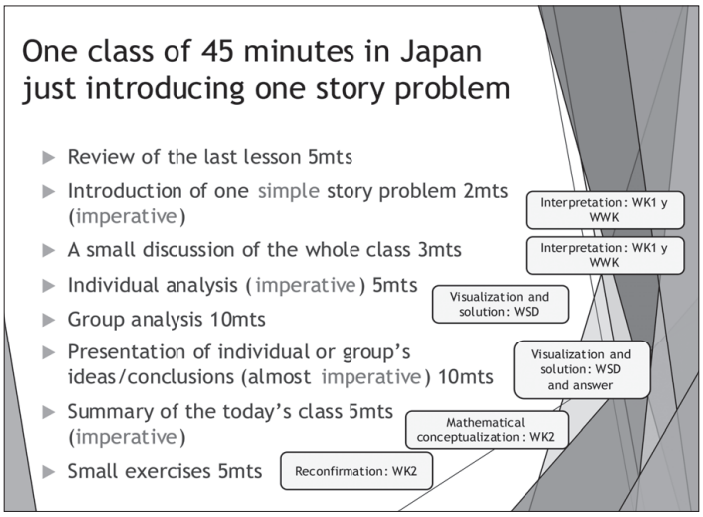

Figure 1. How to develop one mathematics lesson in Japan

As Figure 1 illustrates, a mathematics lesson in primary school starts from introduction of one simple story problem and the whole class discussion is conducted to understand and extract important mathematical information from the story problem. At this moment, teacher can give hints to interpret the story problem, key questions such as What We Know (WK), What We Want to Know (WWK), What We Should DO (WSD). If necessary, teacher and students discuss about how to visualize the problem, using the extracted information. After that, each student needs to work individually to find out mathematical sentence or solution based on his/her interpretation and visualization on the story problem. If necessary, teacher develop group work where students discuss and interact with other students and deepen their idea. At the end, the whole class presentation is implemented and they conclude the solution and answer, and summarize what they have learned (mathematical conceptualization). If there is time, the students do exercises to reconfirm what they have learned.

Structuration of blackboard is another key trait of Japanese style of mathematics lesson, which is also introduced in this session. Japanese teachers manage the blackboard to structure students' notebook taking. They usually do not erase writing on the blackboard during a lesson. Therefore, students have enough time to take a look at the flow of the lesson and even go back to the previous topic or discussion. When they write in their notebooks, they can easily copy what is written on the blackboard. As Figure 2 illustrates, usually the blackboard for mathematics lesson is composed of three parts:

(1) Introduction of a story problem & Interpretation
(2) Sharing students' ideas with visualization & solution (presentation)
(3) Summary and exercises (conceptualization and reconfirmation)

Review of the previous lesson Introduction of today's story problem Interpretation of the problem Key information - - -	Today's aim Sharing students' (groups') ideas Ideas of visualization & solution - - -	Summary Exercises

Figure 2. Typical structure of blackboard writing in mathematics lesson

This structure of blackboard corresponds to the lesson organization introduced above. Besides, the students' notebook writing coincides to the writing on the blackboard, too.

3.1.3. Discussion

The participants asked to lecturer about how teacher can help students to learn division (how Japanese teacher help them to learn division). Many students face difficulty to understand the meaning of division before understanding how to divide numbers. Therefore, the lecturer recommended to go back to the introductory contents of division, like for earlier graders, G1-3. He explained as follows:

> "In the case of Japan, students of G1 learn how to give/distribute to people "equally". Division actually means to distribute equally something to people. If they understand how to distribute equally, they have a primitive, but, correct meaning/concept of division. When teacher introduce mathematical sentence of division with a sign "÷", if teacher successfully links students understanding of how to equally distribute and the abstract sign "÷", children make less mistakes to calculate the division. To help students to understand this concept, Japanese teachers usually introduce concrete or pictorial materials or diagrams as introduction of division, and let the students practice the division, by manipulating these materials or diagram."

3.2. Topic: Metacognitive skills in solving Complex, Unfamiliar and Non-routine CUN tasks

3.2.1. Objectives

There are three main objectives.

(1) To understand the characteristics of CUN task
(2) To understand the concept of metacognitive skills.
(3) To investigate what kind of metacognitive skills students use when solving word problem, and how to teach them.

3.2.2. Contents and Activities

Firstly, the lecturer introduced a CUN task and asked participants to solve it. In addition, asked them to think about how they teach this type of task in their classes. We discussed the characteristics of CUN tasks by comparing two general word problems. Since they solved given CUN tasks using various methods, they were able to understand the characteristics of CUN tasks.

Secondly, the lecturer explained the concept of metacognitive skills by differentiating between cognitive skills and meta-cognitive skills. In addition, the lecturer and participants discussed the importance of metacognitive skills by showing some previous research that students who use metacognitive skills effectively have a higher rate of correct answers for word problems.

Thirdly, the lecturer introduced the four steps of solving word problem and what kind of metacognitive

What is cognitive and metacognitive skills in solving CUN task?

Problem Solving Stage	Cognitive skills	Metacognitive skills
Understanding the problem	Understanding the problem	- Do I understand what the problem asks? - Do I have enough information to solve the problem?
Planning	Making mathematical sentences	- What steps should I take to solve it? What do I need to do first? - Have I solved similar problems before? - How is the answer likely to be?
Executing the plan	Solving the task	- Am I solving it correctly? - Are there other ways to solve the problem more effectively? - If it doesn't work, is there another way to solve it?
Reviewing the process	Confirming the answer	- Did I answer the questions correctly? - Can I explain the process of my answer? - Which part did I take care most to solve the problem? - What was the most difficult part?

Figure 3. Meta-cognitive skills when solving CUN tasks

skills are used in each step. They discussed that it looks like various types of metacognitive skills are necessary in each step, but, the important point is to monitor themselves. Therefore, to improve students' metacognitive skills, teachers have to promote students to think about what they are doing during the process of solving word problem.

Finally, the lecturer gave another CUN task and analysed together with participants what kind of questions, guidance & support in each step of solving word problem they should give to the students to promote their metacognitive skills.

3.2.3. Discussion

In terms of CUN task, participants solved the given tasks using various ways during the activity. They commented that the problems were difficult but interesting. It is expected that these kinds of problems are introduced to the mathematics education in Jamaica.

Concerning metacognitive skills, some teachers commented during Q&A. They mentioned that they usually ask those questions which were introduced in this presentation (Figure 1) to the students when teaching word problems. In other words, they unconsciously encourage the development of children's metacognitive skills. I suggested that teachers continue to guide students to improve their metacognitive skills by asking those questions consciously when solving word problems or CUN tasks.

3.3. Topic: Materials and Activities for Number and Calculations

3.3.1. Objectives

There are three main objectives.

(1) To inform how numbers and calculations are taught in Japan.

(2) To share with Jamaican teachers teaching skills and knowledge used in Japan.

(3) To exchange opinions and ideas of real classroom activities.

To achieve the above objectives, in this lecture, the lecturers selected some characteristic properties with proper examples of the mathematical problem as related to real life, to help their understanding and give some applicable uses for their classrooms.

3.3.2. Content

The lecturers explained about numbers and calculation strands, especially two kinds of properties such as "Properties of Arithmetic" and "Properties of Fractions." These properties are complicated for children in any country. Also, it seems to be difficult for teachers all over the world to make children understand. In Jamaica, these contents are taught in every grade and become more and more difficult grade by grade. Looking at every grade in Jamaican textbooks, it was noticed that many expressions to practice calculations are there. Surely, it is important for children to exercise calculations, but, at the same time, the lecturers strongly think children should learn the way of thinking about calculations and use

the expressions along with their daily life. This time, in order to relay this to the teachers, we introduced the way of thinking and focused on the process of expressions and importance of calculations for fractions. In the part of the property of arithmetic, the lecturers showed the three types of properties, Commutative Property, Associative Property, and Distributive Property and confirmed how they look like. Actually, these properties are taught in different grades in Jamaica and Japan, so, the lecturers focused on both countries' education contents. This helps to make clear the differences of both countries' features and to learn the new approach.

In the part of fractions, the lecturers made sure of the difficulties for both Jamaican and Japanese children and deepened the way of teaching them. Regarding the properties of fractions, they introduced the method in which students explain their reasoning by words and diagrams to Jamaican teachers. In the case of simplifying, they explained how children in real classrooms devise their ideas through two characters' Hamilton's and Sheena's opinions as illustrated in Japanese textbooks. In the property of equivalent fractions, the characters were asked to think how to compare fractions with different denominators, and to realize that it is enough to find the least common multiple.

3.3.3. Activities

At first, the lecturers introduced properties of arithmetic. They confirmed those properties' definitions altogether and showed some visual images following the definition. After that, they shared the way of teaching in Japan. Jamaican teachers also know these properties, so we had them answer some easy situation problems. An example is shown in Figure 4.

Although they could tell the right answer, almost all of the teachers seemed to answer like Hamilton. From this, the lecturers wish teachers had many ways of focusing and tell children the meanings of expressions with some visual images along with daily life. Second, the lecturers explained properties of fractions and checked how to teach calculations of fractions (Figure 5). We don't use the numbers of fractions so much in the real life but we think if we have the knowledge of fraction, it is possible to make their life easier.

The lecturers shared "simplify" like the below

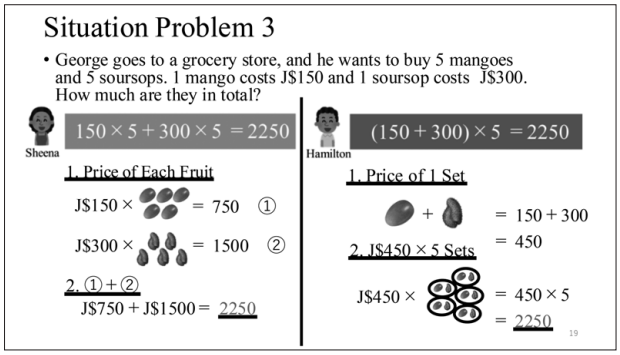

Figure 4. Example of distributive property

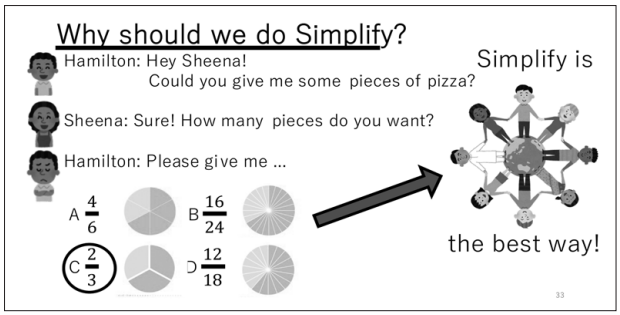

Figure 5. Simplification of fraction

example. In the conversation of Hamilton and Sheena, Sheena asks Hamilton how many pieces of pizza he wants. Four answers are here and those are different numbers but the same magnitude as 4/6, 16/24, 2/3, and 12/18. In real classrooms, most children will choose. Simple answers are much easier to understand. However, if there are many types of answers, children will be confused. When representing fractions, children will be able to find the best answer without hesitation by making a promise or the rules to use the simplest form. This is why we should simplify and think Greatest common Factor (GCF) and Lowest Common Factor (LCM) at the same time.

3.3.4. Discussion

Through this session, the lecturers themselves could know how they had studied and taught numbers and calculations again. Moreover, they could learn about the curriculum in Jamaica, especially about numbers and calculations strand. They could have experienced so precious time.

On the other hand, before this session, they were planning to exchange their ideas with teachers in Jamaica and discuss with them. Also, through their presentation, they had wanted the Jamaican teachers to discuss with each other so as to promote and improve their teaching by themselves. However,

because of the poor time-management and the limitation of the online activity, the lecturers could not conduct it effectively. If they implemented the session as they imaged, they could take their teaching skills much higher and the Jamaican teachers would be able to promote their passion with each other as well.

During the session, the participants got a question about making situation problems. They wanted to get any other situation problem examples. The lecturers easily understand that it is very difficult to make them related to daily life, for a deeper understanding of mathematical contents; because it seems not to be common according to our views of textbooks in Jamaica.

However, the lecturers tried their best to provide situation problem examples related in Jamaican contexts and put all the stuff that the participants needed for making the problems. Thus, the lecturers hope they will discuss their ideas and develop their knowledge of making new situation problems.

Moreover, the lecturers could realize the local parts and the global parts of mathematics through this session. We usually believe mathematics is an invariant truth not depending on the nations or any culture background. However, it has a strong connection to their background at some points. Hence, it is important to consider the impact when we understand the situation of mathematics education in different countries. It will help to think of more effective ways of support.

Through this case study, the lecturers hope the participants acquired something useful to teach children arithmetic properties more enjoyably from now on.

Finally, the lecturers of this session, are honored to participate in the meritorious online training course with keen Jamaican teachers. They greatly thanked Mr. Hamilton and Professor Ishizaka to have given this excellent opportunity.

3.4. Topic: Materials and Activities for Geometry

3.4.1. Objectives

Angles: To let the participants understand how to make students be familiar with angles and to enhance students' mathematical thinking skills.

Quadrilaterals: To let the participants understand how to help students better understand the definition of quadrilaterals.

3.4.2. Contents and Activities

(1) Angles

a) Teaching tool for angles

Firstly, the lecturers introduced a teaching material that can show students angles from 0° to 360° using two disks (Figure 6). Jamaican textbooks showed pictures of teachers using their arms to show angles. However, showing the size of angles using one's arms does not allow for angles beyond 180° . Therefore, teaching with two disks is an easy tool to create that can show students angles up to 360° and develop their sense of the size and type angles. By using this material, students can visually display angles of different sizes and types. The lecturers had asked the participants to download and print out the data of the parts of the teaching material beforehand, and to cut out the two disks to get the parts of the teaching material by themselves. In the workshop, the participants completed the materials by inserting each notch on the disks with each other to overlap the two disks, and experienced the freedom of creating angles by turning one disk against the other disk. They also explained that this material is useful for introducing angles, to get a sizing sense of the angle.

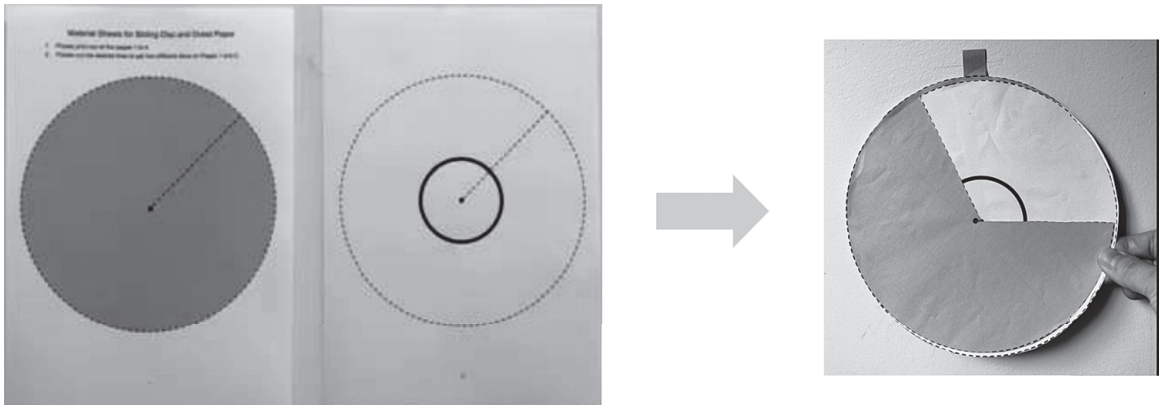

Figure 6. Teaching material of angles

b) The usage of protractors

Students of various ages apparently struggle to read the size of an angle from a protractor. The situation has gotten even worse during online learning. GeoGebra, a free digital tool for math learning and math education, can be of big help to overcome this issue. During the teacher training the lecturers discussed the main principles of the usage of a protractor and measured various angles. Using GeoGebra teacher is able to quickly show students how to measure angles and how to read the size of an angle using a variety of examples.

c) How to calculate reflex angles

There are many ways to measure the size of a reflex angle, but during this training, two basic measurement methods were introduced: "180° plus the rest of the angle" and "360° minus the angle other than the one you want to measure". The purpose of this training was to introduce to the teachers an idea that there is not only one correct way to measure a reflex angle and that this gives them and their students an opportunity to develop students mathematical thinking skills by letting students decide which approach to use.

(2) Quadrilaterals

a) Definitions of the various quadrilaterals

In preparation for the next "Classifying Quadrilaterals" activity that follows, the lecturers had an activity where they reviewed the property or definition of each quadrilateral and relationship for all. They started with an irregular quadrilateral and explained that the quadrilateral transforms as more conditions are added, i.e., trapezoid, parallelogram and finally square, showing the slide of relationship of quadrilaterals (Figure 7) and so on.

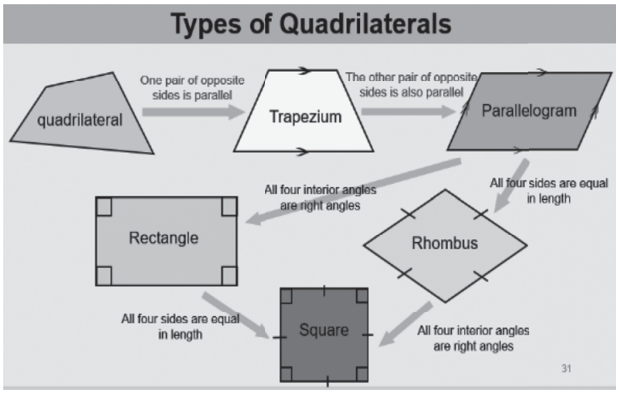

Figure 7. Relationship of Quadrilaterals

b) Activity for understanding the definitions of quadrilaterals

Since there are many types of quadrilaterals and the definitions of each are very similar, it is difficult for students to understand and discriminate the definitions correctly. The lecturers introduced an activity to help students understand the definitions in an active learning style, where the teacher does not teach the definitions, but lets the students find them.

This activity consists of the following five steps.

i) Having students draw quadrilaterals freely on the grid sheet

ii) Grouping quadrilaterals students draw

- Students classify quadrilaterals drawn by them into similar groups

iii) Verification of discrimination

- Students look for similarities between quadrilaterals in the same group, whether or not they have parallel lines, equal sides, and whether or not all corners are right angles.

iv) Confirmation of the definition

- Check the names and definitions of each quadrilateral.

v) Drawing quadrilaterals with teacher's instructions

- Students recall and draw the definition of each quadrilateral with teacher's instructions.

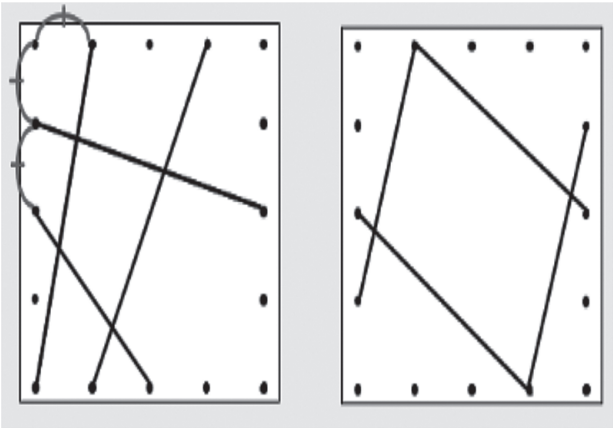

Figure 8. Quadrilaterals on grid sheet.

3.4.3. Discussion

(1) Angles

During the session, Jamaican teachers had a hands-on activity on creating a teaching material to illustrate angles to their students using two disks. Teachers were enthusiastic about creating teaching materials that give them the capability to show angles

of more than 180 degrees. The Jamaican teachers showed great interest in the digital tool, GeoGebra, and how to show their students the appropriate usage of the protractor. Teachers appreciated the opportunity to learn about a new interactive tool, as due to the impact of COVID-19, the need for online education is now unavoidable. Finally, in terms of how to teach the problem of obtuse angles, some of the Jamaican teachers mentioned that they only teach "360° minus the angle they want to measure" but in order for students to have a deeper understanding on the topic of angles, shapes, and mathematical phenomena, teachers need to draw out various ideas from students rather than sticking to one idea. Therefore, the lecturers hope that introducing these two basic ways of measuring angles will be a stepping stone in teachers' journeys to help their students become more independent learners and to develop their mathematical thinking.

(2) Quadrilaterals

1) There was a question: "Isn't a rectangle formed by transforming a square? " The answer is yes. Any quadrilateral in Figure 8 above can be transformed in both directions (not only one direction). However, the diagram is not just showing the change of shapes next to each other, but it shows, in the overall flow, the shapes change more and more depending on the number of conditions. When looking at the whole flow, student can systematically understand the relationship of each quadrilateral, which was probably taught independently before. It is useful to objectively see the differences and similarities between each quadrilateral and develop their logical thinking skills. It will lead to the fun of mathematics and the joy of deep thinking. The lecturers should have emphasized this concept when asked this question.
2) The question was raised whether this activity would be difficult for the students. Yes, it can be difficult to do on the first try. So, the lecturers recommend doing this activity as a review after the students have learned all the quadrilaterals. Students start learning from squares and rectangles. After that, they can move on to more complex shapes such as rhombuses and parallelograms. This activity is a good way to organize what they have learned about quadrilaterals so far.

3.5. Topic: A New Approach for Calculation Time and Activities for the Inquiry Based Learning (IBL)

3.5.1. Objectives

The main objective for this session is to introduce the concept of Advanced-Calculation Time (A-CT) and to assist teachers in developing key questions for their lessons.

3.5.2. Content

The training was categorized into five sections in order to provide coherence to lead into the main objective. The first section provided an overview of the National Standards Curriculum (NSC) which summarized the curriculum's aims and objectives as well as standardized teaching model (5E, 4C). It also briefly summarized the criteria for the national assessment for primary schools which is called the Primary Exit Profile (PEP) exams. The second section detailed the structure of Advanced Calculation Time (ACT) which included sample questions. The next section summarized the current research framework being conducted at NUE which included research questions and methodology. The last two sections entailed the teacher training activity (guide to creating key questions for exploratory activities) and an interaction /Q & A.

3.5.3. Activities

The activities for this session were mainly focused on introducing the structure of A-CT with sample questions and help teachers create key questions for their lessons. Teachers were guided to develop key questions for 4 of the 5E cycles using a guided key questioning model. Teachers were first introduced to four general types of questions that were later linked to different Depths of Knowledge (DOK) levels and categorized as either beginning or developing questions based on the assessment criteria of Jamaica (Figure 9). Teachers were then given a sample of questions in relation to this questioning model for a selected lesson from the Jamaican curriculum (Figure 10). Upon completion, teachers were then given an introductory scene for a lesson adopted from a sample Mathematics plan issued by the MoEYI in 2020. Teachers got the opportunity to create their own questions for this and share their questions using chat or sharing their worksheets through video and audio share.

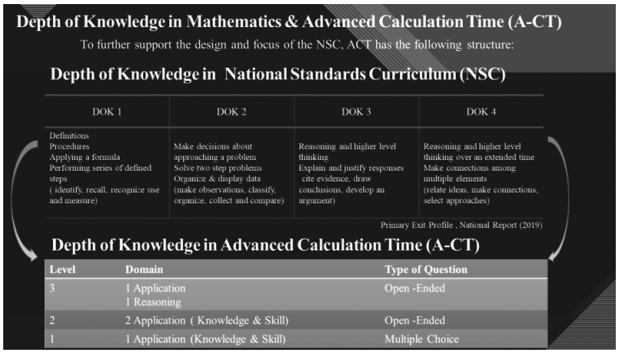

Figure 9. Structure of A-CT

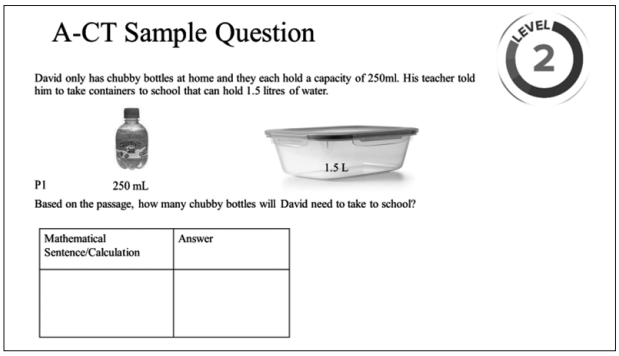

Figure 10. Sample Question of A-CT

3.5.4. Discussion

Some questions and comments were received during the Q&A. Most teachers expressed through the online chat that the presentation was understandable and interesting. Another teacher expressed verbally that the A-CT seemed to be well aligned to the focus of the National Standards Curriculum (NSC) and that she thinks it would be easy to apply in this nature and asked about a time frame for implementation of this programme. This was facilitated by Mr. Hamilton whose response stated that there would be a further process of finalization that would need to take place before officializing this A-CT in accordance with its predecessor which is Calculation Time (CT).

However, he was able to provide a tentative timeframe of approximately next two to three years. In addition, one participating teacher reported that she didn't notice a confirmation of categorization of key questions from the training as the teachers made and shared their questions. However, she was notified by the lecturer that this confirmation did take place verbally through the online chat responses that teachers gave. It was further discussed that maybe there was a technical issue during this exercise. In conclusion, an overall view of the training seems to suggest that it was a success with many teachers stating that they found it interesting, clear, understandable and practical as it is linked to the NSC.

However, as a way forward, it is important to consider that teachers seemed motivated and so we can use this opportunity to act quickly for future implementation as they seemed very interested in applying A-CT. In addition, for future trainings, it is also important to consider technicalities such as the one that occurred in order to ensure that all teachers can benefit from the training as best as possible. In the future, the lecturer thinks that CT is still necessary for Jamaica and can still be used in conjunction with A-CT as one develops basic mathematical skills and the other can develop critical thinking and problem-solving skills which are all necessary for the focus of the curriculum. Also, the lecturer thinks that most teachers were able to create key questions very easily using the suggested guide but still many teachers didn't attempt to create questions for the extended activity and maybe this could be an area of challenge for teachers and become a focus in future trainings.

3.6. Topic: Materials and Activities for Measurement

3.6.1. Objectives:

To let the participants understand how to help students have a sense of quantity and better understand the measurement.

3.6.2. Content & Activities:

The lecturers of this session proposed lessons and learning activities related to measurement. In the first part of the presentation, we gave an overview of the contents of each grade in the measurement domain based on the Jamaican curriculum, and explained the importance of "the sense of quantity" that is specifically the aim being fostered in this domain. Sense of quantity is generally defined as "An approximate sense of the size of a quantity without the use of instruments" or "A sense of the actual size of a quantity given in a certain unit". First, the lecturers set up an activity for the Jamaican teachers to draw a 5 cm line without using a ruler in order to make them realize about the sense of quantity. Next, they introduced the following questions from Japan's National Assessment of Academic Ability for 6th graders (2008), which were intended to assess the sense of quantity, and asked the teachers to actually solve them.

Q1. Which of the following weighs about 1 kg?

(1) An empty school bag (65.8%) (2) A one-yen coin (4.8%) (3) 5-box vaulting box (25.5%)

(4) A handkerchief (3.1%) Answer: (1)

Q2. Which of the following weighs about 150 cm^2?

(1) Stamp (1.3%) (2) Postcard (17.8%) (3) Cover of a textbook (49.2%)

(4) Floor of a classroom (30.6%) Answer: (2)

Figure 11. Results of some questions of Japan's National Assessment of Academic Ability for 6th graders

These results (Figure 11) show that many students lack the sense of quantity that is required to be developed in the measurement, and that this is due to factors such as a lack of life experience and instructions that are too focused on learning units and calculations. Through these indications and activities, the lecturers hoped that Jamaican teachers would realize the importance of fostering the sense of quantity, and they made suggestions on how to improve mathematics classes through experiential learning with actual feeling and applications to students' daily life.

One of the suggestions is an example of how to develop lessons through 5E learning cycle in the curriculum of Jamaica, which represents five key interrelated processes; Engage, Explore, Explain, Extend (or Elaborate), and Evaluate. The lecturers introduced a lesson plan that incorporates the activity "Let's make about 1kg using everyday objects" into the second-grade lesson on "weight" shown in the Jamaican curriculum. For each process, they presented specific examples of learning activities and teacher's questions that promote students' understanding and thinking as shown in Figure 12.

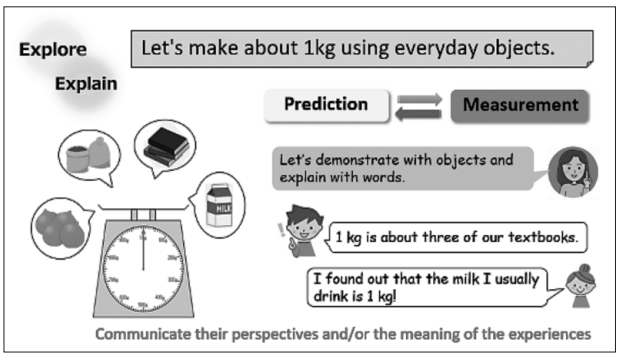

Figure 12. An example of the activities along the 5E

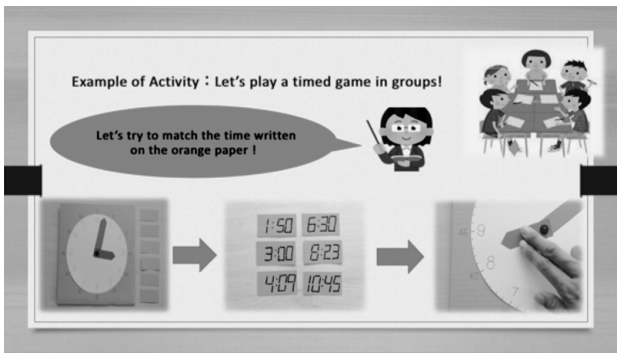

Figure 13. An example of the activities along the 5E

In the second half of the presentation, the lecturers showed examples of students' misconceptions in measurement and how to support them. The first part focused on how to read a clock and the difference between time points and time intervals. They introduced the potential misconceptions in these two areas and gave suggestions on how to solve them.

For the part on how to read a clock, the lecturers suggested activities to be done in groups or pairs. This activity involved using a simple clock that can be made out of paper and matching it with the time written on the paper as shown in Figure 13. Through this activity, it is expected that students will not only get used to understandable times such as "3 o'clock" and "12 o'clock", but also get used to detailed hours and fractions such as "12:23". This activity will also help them understand the meaning of long and short hands, and how to move the hands of a clock.

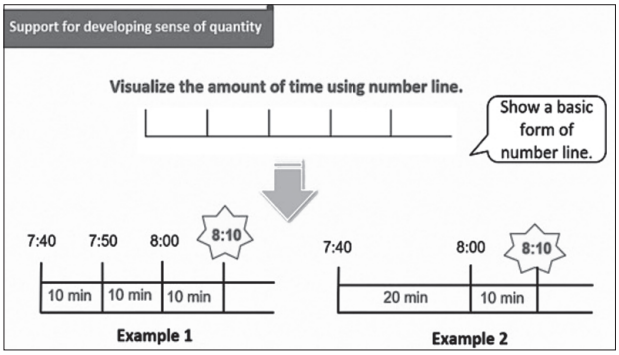

Figure 14. Support for developing sense of quantity

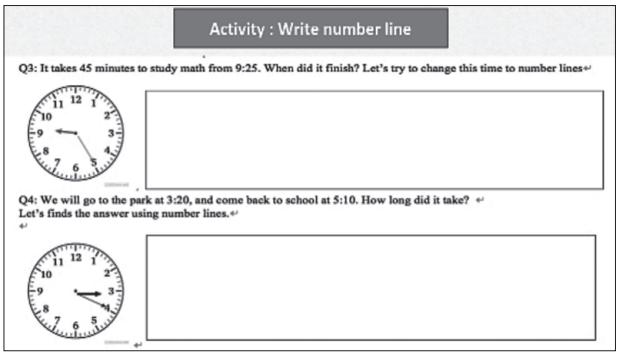

Figure 15. Activity: Write number line

In the time points and time intervals section, after asking the participants about the meanings of time points and time intervals, they explained again that a time point is a moment in time, or a point in time, and the time interval is the interval between a point in time and another point in time, or the length of time that has passed. Then, they introduced the use of number lines to support our understanding of time point and time interval as shown in Figure 14. The lecturers also believe that by visualizing time through the use of number lines, they can clear up this misconception. In addition, they think that it is important to teach in the context of students' daily lives, such as "This is the time when everyone is always playing outside with their friends," because overlaying this with students' daily lives helps them get a better sense of the amount of time. Next, the lecturers actually conducted an activity in which participants were asked to convert time into a number line according to two questions they had prepared in advance as shown in Figure 15. After the participants presented several examples of their solutions, the lecturers gave them one example solution for each problem.

Future task of teachers is to devise specific activities to make it easier to incorporate the learning method of time using number lines in the classroom in elementary school in Jamaica. Also, when we ask students to actually write the number line to develop a sense of the amount of time, it is important that we teach them according to their abilities and learning speed. This is because some students divide their time into 30-minutes or hourly units, while others divide their time into 5-minute or 10-minute units, and each student has his or her own way of making number lines.

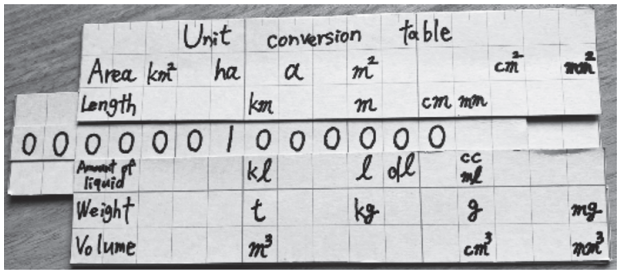

Figure 16. Unit conversion tool

In the second part, the lecturers proposed a teaching method for unit conversion, a point that students tend to struggle with in measurement. First, they introduced the unit conversion tool as shown in Figure 16. The purpose of this tool is to establish the conversion of units. By using it, students can visually understand the conversion of units. For example, this tool has km, m, cm, and mm written in a connected format, which makes it easier for students to understand the relationship between them. Also, by moving and using this tool, students can learn to convert units independently and develop their thinking skills and by moving it, they can think of questions and answer them by themselves. As they repeat the process over and over again, they will be able to establish the basic concept of unit conversion.

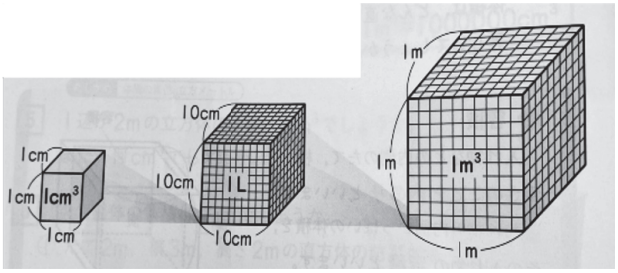

Figure 17. Support for developing a sense of quantity (Using figures)
(Sourse; 5th grade math textbook p.26 Kyouiku shuppan 2019)

Next, the lecturers made several suggestions for developing a sense of units. One is to use the figure to develop a sense of quantity as shown in Figure 17; this figure shows that if you collect 1,000 cubic centimeters, it becomes 1 liter, and if you collect 1,000 liters, it becomes 1 cubic meter, so you can get the image that one cubic meter is 1000 liters.

Figure 18. Support for developing a sense of quantity (Experiential activities)

In addition, the lecturers introduced an activity that can help teachers grasp the sense of quantity of one cubic meter through experience as shown in Figure 18. The activity is called "Let's make a cubic meter". Using a one-meter scale and a piece of tape, students can make a cubic meter. They then asked the Jamaican teachers to predict how many adults could fit in the cubic meter. This time, the lecturers actually showed five adults could fit in one cubic meter. The teachers seemed to enjoy making predictions, and the lecturers were able to make them understand the activity in a concrete way.

3.6.3. Discussion

The lecturers interacted with the Jamaican teachers by asking them to tackle the various problems they showed by using the methods they suggested. It might have been the first time for the Jamaican teachers to do all of these activities, so they commented that it was very interesting and that they would like to actually use them. Also, the lecturers received good responses from them about the method of using the number line as a way to develop a sense of time. The use of a number line as a way to show the amount of time seemed new and fresh to the Jamaican teachers. Hopefully, this method will help Jamaican students learn and deepen their understanding.

Knowing units is not enough to develop the sense of quantity and it can be developed through experiential activities and application to real life. The lecturers hope that the Jamaican teachers would know the importance of developing the sense of quantity and incorporate it in their classes in the future.

4. Summary

Due to COVID-19, it was not possible to send short-term volunteers to Jamaica, which also made face-to-face volunteer activities impossible. Not only students but also educational staff of NUE were disappointed. However, with the support of the MoEYI and JICA, it is a great pleasure to have planned and successfully completed this online volunteer activity. During the three days long sessions, approximately 60 Jamaican teachers joined this online teacher training. The participants proactively worked on the prepared activities and gave good questions and comments on them, too. All the lecturers would like to express their deepest gratitude to all the people whom have collaborated to for this event.

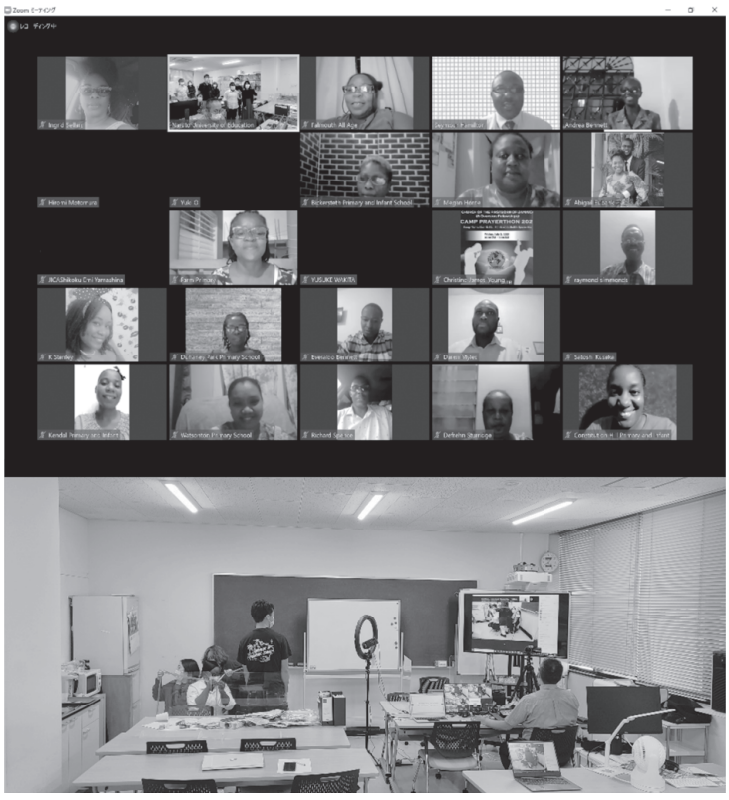

Figure 19. Photos of the online volunteer activities