Teacher Education Past and Present: Addressing Current Challenges for a Better Future

Southeast Asian
Ministers of Education
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The ***Journal of Southeast Asian Education*** is an official scholarly publication of the Southeast Asian Ministers of Education Organisation (SEAMEO). The primary goal of this international journal is to give information and analyses to aid in policymaking and planning for the region's countries. This joint publication (SEAMEO and University of Tsukuba, Japan) encourages the sharing of ideas on educational topics and comparative studies for students, instructors, researchers, and lecturers on regional and global platforms. Each article was prepared to provide readers with an overview of how education systems and advocacy were designed and executed, particularly in establishing national capacities. The SEAMEO Secretariat issued the first issues of the ***Journal of Southeast Asian Education*** in July 2000.

Contents

Foreword

The COVID-19 pandemic has created unprecedented conditions in all areas of social life and changed the educational landscape across the globe. Teachers in Southeast Asia have gone through a process of transformation in their teaching approaches and practices, in particular, the adoption of new learning delivery modalities such as online mode of teaching and learning. Due to the abrupt change, teachers faced several challenges in using new technology for teaching and learning, tutoring, and motivating students from a distance.

Many if not most of the teachers began to provide education on virtual mode without much experience and prior training. As a step forward in strengthening the preparation of teachers in the new normal, the Southeast Asian Ministers of Education Organization (SEAMEO) has put together a selection of quality articles under the theme, "Teacher Education Past and Present: Addressing Current Challenges for a Better Future" based on the 10th SEAMEO-University Tsukuba Symposium in the Journal of Southeast Asian Education, SEAMEO's official research publication. This journal aims to showcase the best practices in teacher education and training in responding to disruptions in education due to the pandemic. The articles in this journal also identify the opportunities and challenges faced by teacher education and training institutions in Southeast Asia during the pandemic. I express my sincere gratitude to the University of Tsukuba (UT) of Japan for their support and dedication as this journal will certainly form a valuable addition to the existing body of knowledge on teacher education and training. I hope that this journal will inspire policymakers, teachers, and learners to act towards consolidating the policy changes moving forward as well as improving practice responsive to the demands of the new normal and to future needs and challenges in teacher education and training.

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SEAMEO CECCEP Support for In-Service Teacher Training for Early Childhood Care Education

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ABSTRACT

By the second half of the year 2021 after the COVID-19 pandemic, Indonesia had already re-opened the schools with very strict protocols. During the pandemic, Indonesia suffered a negative impact on learning process. The learning loss equals up to 6 months of learning per year and the gap between students from rich and poor families increased 10%. The Ministry of Education Culture, Research and Technology adjusted school regulations during the COVID-19 pandemic era to prevent the negative impact of COVID-19. Government supports programmes for distance learning alongside any health programmes such as vaccines. Health protocols monitoring system at schools is provided by the Ministry of Education, Culture, Research and Technology through an online service. One of the programmes initiated by the Ministry of Education, Culture, Research and Technology to catch up with the learning loss during the COVID-19 pandemic era is Building Back Better with two core programmes: remedial programme and reorientation of learning.

Southeast Asian Ministers of Education Organization Regional Centre for Early Childhood Care Education and Parenting (SEAMEO CECCEP) developed innovations for enhancing teaching and learning during the pandemic era especially for the teacher qualification such as conducting home visit survey, as well as planning, conducting, monitoring and evaluation programmes. SEAMEO CECCEP also conducted programmes of teachers' in-service training during pandemic era such as children participation in a research process, implementation of holistic integrative ECE, mindful parenting, "dwi-asas" character, and dialogic reading.

Keywords: education, early childhood, innovation, international, pandemic, training

INTRODUCTION

COVID-19 pandemic has been declared for 2 years. Many policies have been taken to cope with this pandemic situation. One of the biggest policies was school closing. This policy has the largest impact on education. Most of the schools have been performing study from home using distance learning methods. Teachers and students have to embrace distance learning in their daily activities. Teachers must prepare the materials and deliver the learning activities online. Students must gain efforts in learning in relatively new methods and advancing technology to cope with the methods.

Negative Impacts of COVID-19 Pandemic on Learning

The Ministry of Education, Culture, Research, and Technology (MoECRT) of the Republic of Indonesia with the World Bank has issued a report on education losses from the COVID-19 pandemic. The report said that the school closure had resulted in a loss approximately 0.44 - 0.47 or equivalent to 5-6 months of learning per year. This number showed the impact of school closures during the COVID-19 pandemic in Indonesia had become a new phenomenon.

The report also indicated that there is an increasing gap between the rich and poor family background students up to 10%. While the students with rich family backgrounds can afford the digital technology and infrastructure for distance learning, some of the students with poor family backgrounds are not that lucky. Many students have to use their parents' smartphones in turns with their siblings in order

to catch up with the class. Other students are not fortunate enough to get a good signal or internet connection for their devices just to communicate with their teachers.

The drop-out rate in primary schools also increased to 10 times. The drop-out cases are dominated by students with poor family backgrounds. The projection also reported that the drop-out rate would increase in the upcoming years if the government continues the school closure.

However, some of the districts had minimal impact on the pandemic such as Yogyakarta and Bukittinggi due to the effective support and parents' engagement in the student learning process. It seems parents with higher education backgrounds show to be more supportive to their children's education.

The teachers had faced no less difficulties during the school closures. The challenges mostly were the lack of guidance, training, and resources to support distance learning during the COVID-19 pandemic era. Although distance learning is not a new phenomenon in education, this method is not familiar for basic education actors. They had to embrace distance learning in their daily activities. With their limitation, they are required to find compatible technology the most suitable to their needs and ability. Some had discovered effective and efficient ways in using digital technology, but some teachers still struggled to find that way.

School Adjustment Regulation

With the negative impacts of the COVID-19 pandemic, there were a lot of considerations to reopen the school again. The MoECRT adjusted

school regulations during the pandemic era to prevent the negative impact of COVID-19 pandemic. Since July 2021, local governments have applied limited face-to-face learning at schools according to the pandemic level at the district. Schools that fulfilled all necessary conditions may reopen but not obligatory, subject to permissions from parents and local authorities.

The health protocol monitoring systems at schools by MoECRT are school readiness checklist, compliance, screening, and surveillance. Some of the school readiness checklists are: school workforce for COVID-19 protocols, availability of sanitation facilities, access to health facilities and services, tracking for students-teachers-administrators, and vaccination programs. These checklists are provided by the Ministry of Education, Culture, Research and Technologywith online applications connected to the Ministry of Health online applications. School workforces are obligated to observe the implementation of health protocols at school as well as the screening on COVID-19 symptoms in schools. These school workforces are supervised by the local workforce that was conducted by local authorities. The Ministry of Health has provided an online application for real time identification to screen all visitors in every public area. This application is called "*Peduli Lindungi*" and can recap screening result QR code.

The Indonesian government also provided support programs for distance learning such as access to internet networks for schools, internet quota subsidies, and more access to online learning materials.

Building Back Better

In order to prevent losses and more damage in education from the negative impact of the COVID-19 pandemic, some action needs to be taken. One of the programmes initiated by the Ministry of Education, Culture, Research and Technology to catch up with the learning loss during the COVID-19 pandemic era is Building Back Better with two core programmes: remedial program and reorientation of learning.

Remedial programs are required for the students that were left behind. Teachers are under obligation to perform diagnostic tests to the students periodically to find out cognitive and non-cognitive effects on students. Non-cognitive diagnostic tests include psychological-social-emotional welfare, learning activities at home, and family situation. Cognitive diagnostic tests are performed to identify the students' academic performance and the teachers will use the result to specify strategies for learning and remedial interventions. The activities involve intensive observation to diagnose learning deficiencies, identify the most essential and foundational development aspects, define learning goals, remedial target, schedule and necessary resources, combined with the current ongoing learning programs. Teachers should allocate enough time to students to participate. Information and communication technology use is crucial in this aspect and teachers need to increase their competencies on digital skills and pedagogies.

On the other hand, curriculum and learning need to be reviewed. The Ministry of Education, Culture, Research and Technology encourages the schools to adopt emergency curriculum

in special occurrences. This curriculum is still based on "Kurikulum 2013" with some simplified basic competencies and focused on essential prerequisite competencies for the next level. The schools are expected to simplify the scope of learning outcomes into the most essential and foundational so the learning is based on student attainment and development. The teachers should perform the teaching relevant to students' life, culture, and future needs. Therefore, teachers should enhance their competencies on digital skills and pedagogies.

Innovation for Enhancing Teacher Qualification

Southeast Asian Ministers of Education Organization Regional Centre for Early Childhood Care Education (SEAMEO CECCEP) is a regional centre focusing on enhancing early childhood education and parenting in Southeast Asia through research, capacity building, and advocacy. During the pandemic era, SEAMEO CECCEP continued on pursuing innovation in early childhood education and parenting programs. One of the most popular programs is teacher training on planning, conducting, monitoring, and evaluating teaching programs. In this program, teachers are provided with subjects such as planning appropriate lesson plans, conducting innovative digital learning, monitoring the digital learning, evaluating the overall program to have feedback to improve teaching. SEAMEO CECCEP also encourages strong partnership between ECCE teachers and parents.

During the COVID-19 pandemic era, SEAMEO CECCEP had already carried out several teachers' in-service trainings such as Children Participation in Research Process, Implementation of Holistic Integrative ECCE, Mindful Parenting, Dwi-Asas Character (Character Building), and Dialogic Reading. In training on Children Participation in Research Process, teachers are encouraged to engage the children in performing classroom action research and any other research. Children's participation is one key to provide better views and circumstances for performing research.

Teachers training on Implementation of Holistic Integrative ECCE is carried out in several districts in Java for duration of two months. The participants gained more knowledge and skills on performing holistic-integrative education for early childhood. Holistic-integrative ECCE involved nutrition, health, education, nurturing, and protection children.

Mindful Parenting is a training program for teachers and parents in order to get better at interacting with children. Parents are encouraged to deal with their own emotions and situations before they interact with their children because unbalanced emotions may do harm to the children in the future. While in the "Dwi-Asas" Character Building training, teachers and parents are expected to give exemplary characters to the children on decent manners such as courtesy and diligence.

CONCLUSION

SEAMEO CECCEP has been pursuing innovation in enhancing early childhood education and parenting. During the COVID-19 pandemic era, SEAMEO CECCEP had supportdata and research result to the MoECRT for developing policies and programs' references. In the near future, SEAMEO CECCEP needs to accommodate more

requirements from the other countries in Southeast Asia or even in Asia. Many programs can be scaled up into international audiences, so SEAMEO CECCEP can reach wider beneficiaries in early childhood education and parenting.

There is plenty of room and space for innovation in early childhood education and parenting. SEAMEO CECCEP wants to focus more on partnership programs between ECCE teachers and parents and conducting home visit surveys in the next several years.

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SEAQIL's Response to COVID-19 and Training Designs for Pre-Service and In-Service Teachers

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ABSTRACT

Since 2020, during the COVID-19 pandemic and the new normal, SEAMEO QITEP in Language (SEAQIL) shifted the mode of its programs from offline to online and/or blended mode. Some which were held in blended mode complied with the health protocols issued by the Indonesian government. Thanks to technology, the online mode enables SEAQIL to serve more participants in every program. Regarding the teacher training program, in general, the purpose is to improve professional and/or pedagogical competence, either for pre-service or in-service teachers. Furthermore, considering that pre-service and in-service teachers may have different needs and requirements, the training programs are designed to meet the respective needs or requirements. This paper aims to give insights on SEAQIL's response to COVID-19, i.e., adapting its programs and activities in order to assist language teachers to be resilient amidst the pandemic and the new normal. Specifically, it represents SEAQIL's training designs addressing needs of pre-service and in-service teachers. Different training designs are necessary because pre-service teacher trainings focus on learning how to be a teacher while in-service teacher trainings focus on learning how to sustain and improve oneself as a teacher.

Keywords: COVID-19, in-service teacher, pre-service teacher, SEAQIL, training program

Introduction

We all agree that the past two years have been very challenging. Amidst the difficult times, SEAMEO QITEP in Language (SEAQIL, also called the Centre) had learned to adapt to circumstances and implemented innovative ways to overcome the challenges and grasped all the possibilities to fulfil its commitment in improving quality of language teachers and education personnel. The Centre's responses to COVID-19 can be seen from various adaptations implemented to assist language teachers to be resilient amidst the pandemic and the new normal. Thanks to

technology, the online activities enable the Centre to serve more participants in Southeast Asia region and even beyond.

Regarding the training programs, in general SEAQIL designs its trainings to improve professional and/or pedagogical competence, either for pre-service or in-service teachers. Considering that pre-service and in-service teachers may have different needs and requirements, each training program is designed accordingly to meet those needs or requirements. Different training designs are necessary because pre-service teacher trainings focus on learning how to be a teacher while in-service teacher trainings focus on learning how to sustain and improve oneself as a teacher.

In order to explore adaptation applied by the Centre as response the COVID-19 and the training designs addressing needs of pre-service and in-service language teachers, there are 2 issues discussed in this paper: (1) SEAQIL's adaptation as response to COVID-19 and (2) SEAQIL's training designs for pre-service and in-service language teachers. The trainings will be described based on their target participants, modes, contents, and learning outcomes (products) created by pre-service or in-service teachers after joining the programs.

The data and information presented in this paper is mainly based on SEAQIL's program achievement in 2021 (some in 2020)--which can possibly be accessed through the Centre publication in the website or social medias. Furthermore, there are information which are compiled from books or moduls published by the Centre as well as program guidelines provided by the Centre in its training programs.

SEAQIL's Adaptation as Response to COVID-19

Responding the changes resulted by the COVID-19 pandemic, there are at least four types of adaptation implemented by SEAQIL during the COVID-19 pandemic and the new normal: (1) adapting mode/design of activities; (2) adapting theme of activities; (3) adapting products and publication; and (4) "adapting" experts and participants. Each type of adaptation is described as follows.

ADAPTING MODE/DESIGN OF ACTIVITIES

Since 2020 the Centre has shifted the mode of its programs and activities, including training programs, from offline to online and/or blended mode. Some which were held in blended mode complied with the health protocols issued by the Indonesian government. In addition, the former offline-synchronous training is then developed into an online training combining the synchronous-asynchronous mode. It appears that the asynchronous mode provides extra time for the participants to do their assigments, for example, accomplishing the projects targeted in the training program or carrying out a discussion forum or sharing session among participants. Meanwhile, during the synchronous meeting, beside attending lecture or presentation by the training instructors, participants also have opportunity to present their projects or consult their instructor(s) regarding the completion of the targeted project. In other words, by applying the synchronous-asynchronous mode, the participants have more flexibility to manage their time appropriately, based on their own needs without neglecting the targets of the training programs.

Other adaptations of mode/design of activities can be seen from the form of webinars replacing offline seminars; the online competitions to substitute the offline ones; and providing possibilities for intern-students to conduct remote-intership program. Through a newly initiated program, "School Literacy Club"- which was launched in February 2021, the Centre successfully involved 295 intern-students from 17 partner universities in Indonesia, serving 1.970 students at 64 high schools in 12 provinces in Indonesia. In addition, an innovative program, Mandarin Virtual Club, also attracted overseas intern-students, i.e., Chinese university students serving as native Mandarin mentors. This program which was conducted up to 3 batches in 2021 engaged active participation of 10 interns (nominated by the Global Adventurer China) and effectively served 112 pre-service and in-service Mandarin teachers which were mostly from Indonesia and other countries in Southeast Asia region.

Above all, the pandemic and the new normal encouraged the Centre to equip itself with an "updated" technology suitable to carry out online activities adequately, i.e.., the webinars, online symposium, training programs, and other necessities. Limited use of online platforms and facilities prior the pandemic has been developed accordingly to address various needs or services.

ADAPTING THEME OF ACTIVITIES

Mayani (2021) summarizes some problems encountered by teachers amidst the COVID-19 pandemic, among others, technical problems (internet access or devices availability); problems related to teachers' competencies (being ICT illiterate or lack of knowledge regarding online learning methodology); problems with the availability of teaching materials or medias (lack of variations of online learning materials or medias or unsuitable curriculum); and students' active involvement in online learning.

The list shows that there are problems which are basically related to teachers' competency in conducting online learning, such as lack of knowledge in online learning methodology or lack of knowledge in providing online learning medias or materials.

Referring to those issues, the Centre has managed to adapt the theme of its activities in order to assist teachers to be resilient with the new way of learning, i.e., the online learning. In 2021, the Centre conducted 3 events discussing on the use of technology in language learning, i.e., a webinar in April on "Improving Teacher's Foreign Language Competence in the Digital Era" and another webinar in July on "Transformation of Foreign Language Learning in the Digital Era", and the 12th Annual International Symposium on Foreign Language Learning (AISOFOLL) on the theme "The Use of Technology to Assist Teachers and Students in Language Learning".

In addition to webinars, the Centre also organized a forum aiming at prividing a sharing session for language teachers to deliver their best practices amidst the pandemic. The best practices shared by the Indonesian teachers in that forum were then compiled in a book entitled "*Kumpulan Praktik Baik Pengajaran Bahasa pada Masa Pandemi Covid-19*" or "Best Practices of Language Learning amidst COVID-19 Pandemic" (SEAMEO QITEP in Language, in press).

Furthermore, the lack of online teaching materials were responded by the Centre by conducting a training on script writing or creating digital content for language learning. The output products of the training were in the form of animated learning videos and vodcast videos which are accessible through the SEAMEO QITEP in Language Youtube channel.

(https://www.youtube.com/c/SEAMEOQITEPinLanguage).

ADAPTING PRODUCTS AND PUBLICATION

One major change caused by the COVID-19 pandemic is the online class replacing the offline one. Consequently, teachers need to adapt their teaching method to be applicable in online setting. Additionally, teachers cannot abandon the 4Cs competencies (critical thinking, communication, creativity, and collaboration) acquired in the 21st Century. In order to provide teachers with a good understanding on the 21st Century skills in language learning as well as to propose some approaches which may be applicable in virtual classes, the Centre published a modul entitled *Modul Kecakapan Abad Ke-21 untuk Guru Bahasa* or "The 21st Century Skills Moduls for Language Teachers" (Kharismawati, 2021). This modul informs language teachers how to conduct the 21st Century-based learning by implementing three approaches, such as communicative language teaching, cooperative language learning, and mobile assisted language learning approach. Those three approaches are complemented with strategies and evaluation procedures which are well explained in some examples of practical lesson plan in English and German language class.

Besides adapting the content of the moduls, as mentioned in the previous sub-chapter, other publications which are suitable to the new era of learning are the animated learning videos or vodcast videos. The scripts of videos were written by language teachers through some programs, i.e., training on script writing for language learning videos or the virtual language club. After finishing the script, the teachers participating in those programs were trained to produce simple videos for their own uses. Moreover, selected videos uploaded in the Center YouTube Channel can also be used by other language teachers to enrich their teaching materials.

"ADAPTING" EXPERTS AND PARTICIPANTS

The challenge to perform online activities or programs has created opportunity for the Centre to serve more language teachers, education personel, stakeholders, schools, students, and other interested parties in Southeast Asia region and beyond. Thus, to cover wider area of participation, the use of technology to support the program implementation should be maintained consistently in the digital era.

There are at least three advantages obtained by conducting activities or programs online as follows. (1) It broadens opportunity for the Centre to reach the unreached, involving participants from Southeast Asia region or even beyond which is impossible to be gathered offline. (2) Online activities offer broader networks for the Centre to invite experts worldwide. On the other hand, it also opens wider options for language teachers in the region to learn best practices or to improve their knowledge and skills from overseas experts. Thus, learning from each other, from different

side of the world may speed up the education equity for future generation. (3) Online activities cost much lower budget compare to the offline ones. Consequently, the Centre can conduct more programs or activities benefiting language teachers and education personel.

Comparing the Centre's achievement in 2021 and back in 2020, pointing the numbers of participants, the individuals participated were almost double (nearly 11.000 individuals from 23 countries in 2021; compare to less than 6.000 participants in 2020). In term of numbers of programs, the Centre successfully conducted 72 programs and activities in 2021 in comparison to 32 programs/activities in 2020.

To sum up, it can be concluded that SEAQIL's responses to COVID-19 can be seen from the adaptation applied to the current situation, i.e., adapting mode/design of activities, adapting theme of activities, adapting product or publication, and "adapting" experts and individuals participating in the Centre programs and activities. Those adaptations enable the Centre assisting language teachers to be resilient amidst the pandemic and the new normal. Finally, the challenging time caused by the pandemic do not prevent the Centre to fulfil its commitment in improving quality of language teachers and education personnel in Southeast Asia region or even beyond.

Training Designs for Pre-Service and In-Service Teachers

Teacher training programs is a part of the Centre's efforts to conduct teacher professional development. The Centre recognizes that the teacher professional development is very important to improve student learning outcomes. In addition, it is also critical to emphasize on pedagogical content knowledge because it focuses on the pedagogical implication, i.e., planning, instruction, and assessment.

Quoting Shulman (1987) in Solís (2009), pedagogical content knowledge consists of (1) knowledge of subject matter representations (content knowledge); (2) understanding of students' conceptions of the subject and the teaching-learning implications that were associated with the specific subject matter; and (3) general pedagogical knowledge (or teaching strategies); (4) curriculum knowledge; (5) knowledge of educational contexts; and (6) knowledge of the education purposes.

As mentioned earlier in the Introduction, in general, teacher training programs conducted by SEAQIL aim to improve professional and/or pedagogical competencies, either for pre-service or in-service teachers. Covering pedagogical content knowledge in the training programs, it is expected that this knowledge will bridge teachers' knowledge of the subject matter and their knowledge and skills in planning the curriculum (in the form of syllabus or lesson plan) and managing their teaching strategies as well as their interactions with students in teaching-learning process.

Considering that pre-service and in-service teachers may have different needs or requirements, the Centre constructs different programs respectively. Training design for pre-service teachers focuses to train the participant learning how to be a teacher while in-service teacher training focuses to train the participant learning how to sustain and improve oneself as

a teacher. In other words, in-service teachers need to improve their knowledge, skills, and commitments, thus they become more effective in planning lessons, teaching, assessing students' learning, and undertaking other responsibilities in the school community.

Technically, most teacher trainings at SEAQIL are now conducted fully online and/or in blended mode. It should be noted that in addition to be defined as an online meeting with a combination between synchronous-asynchronous, "blended" mode may also refer to a combination between online and offline meeting. This kind of "blended" mode is conducted when the majority of the training participants are from Jakarta and its surrounding area which makes it possible to gather in one particular place around Jakarta. However, there are usually a small number of participants who are attending the training online. Therefore, in this paper, the definition of blended mode puts more emphasis on the combination of synchronous-asynchronous meeting, whether the participants attending the training fully online (i.e., virtually), offline (i.e., face-to-face in an offline classroom), or online and offline.

Before changing the mode of the training programs, in January 2021 SEAQIL conducted an online survey involving 183 language teachers covering 27 provinces in Indonesia. The survey confirmed the respondents' preference of choosing a blended training mode in a form of synchronous-asynchronous meeting. Moreover, mapping the activities during synchronous-asynchronous meeting, the respondents preferred having a discussion forum, i.e., sharing session among teachers and doing training assignments or quizzes within asynchronous meeting. Meanwhile, types of activities requested by teachers in synchronous meeting including presentation from training instructors, presentation by participants, and discussion session. Finally, those findings are then used by the Centre in designing its training programs.

In addition to the result of the survey which mainly focused on the mode of the training and activities requested by the respondents during the training, the Centre also considers other relevant details. Among others, type of competencies targeted in the training, target group of participants, aims of the training, basis of training activities (practical or theoretical basis), the content of the trainings, and the training outcomes (products).

Concerning those details, the following table represents types of trainings managed by the Centre based on the target participants, modes, aims (based on the targeted competencies), basis, the content of the trainings (theme), and learning outcomes (products) created by teachers after joining the training programs.

From the table, it can be seen that the target group of participants for the pre-service trainings are university students, mostly from the third or fourth year. Additionally, SEAQIL also gives opportunity for fresh graduate university students scaling up their pedagogical competencies. Meanwhile, the target groups for in-service teacher trainings are language teachers. Sometimes, teachers are also classified based on the students' levels. For example, trainings for teachers of Indonesian Language for Foreign Learners (ILFL) are categorized into three groups: teachers for beginner level, intermediate level, and advanced level.

Table 1. SEAQIL's Training Designs for Pre-Service and In-Service Teachers

NO.	TYPES	PRE-SERVICE	IN-SERVICE
1.	Participants	University students	Language teachers
2.	Modes	• Blended (synchronous-asynchronous) • Online/offline	• Blended (synchronous-asynchronous) • Online/offline
3.	Aims	Professional and/or pedagogical compentency • Preparing pre-service teachers to have a good knowledge on teaching methodology • Preparing pre-service teachers to have a good knowledge on creating teaching materials/medias/evaluation • Preparing pre-service teachers to teach in a classroom (online/offline) • Preparing pre-service teachers to encounter culture shock or other "real" teaching situations • Learning how to implement curriculum into a syllabus or a lesson plan for a certain level	Professional and/or pedagogical compentency • Updating in-service teachers' knowledge on teaching methodology • Updating in-service teachers' knowledge on creating teaching materials/medias/evaluation • Updating teachers' skills on the current issues • Updating teachers' skills and creativity in creating a syllabus or a lesson plan for any level • Providing sharing session for peer-review, i.e., commenting on others' projects based on their own expertise and experiences.
4.	Basis	• Theoretical basis (and instructors' and/or mentors' experiences)	• Practical basis and sharing sessions in group work

5.	Theme	• Language teaching methodology
		   • Reading
		   • Listening
		   • Writing
		   • Speaking
			• Language teaching methodology
			   • Reading-writing
			   • Listening-speaking
			 (Combining more than one technique to achieve more than one skill)
			 • 21st Century skills
			 • HOTS-based language learning
			 • Developing video scripts for language learning
			 • Classroom action research

6.	Outcomes	• Lesson plan • Microteaching video simulation • Teaching materials (at least in the form of script)	• Lesson plan • Teaching materials/medias (scripts, videos or other formats) • Compilation of good practices

The mode of the training for either pre-service or in-service teachers are mostly conducted in blended mode (a combination between synchronous-asynchronous meeting); and the participants may present fully online, fully offline, or a mixed group between online and offline participants.

Concerning the targeted competencies or aims of the training, the purpose of the training is related to the focus of the respective needs of pre-service and in-service teachers. The former prepares the participants learning how to be good teachers by mastering a good pedagogical content knowledge before entering "real" teaching situation. The latter puts more emphasis on updating or scaling up teachers' knowledge on pedagogical content knowledge as well as providing opportunity for teachers to be peer-reviewers in a sharing session where

they are able to share their experiences and gain or give some inputs for other teachers' problems in a working group. By joining the training, in-service teachers are expected to be more effective in planning lessons, teaching, and assessing students' learning.

In term of the training basis, the in-service teacher training is more practical compare to the pre-service teacher training. Inputs for pre-service teachers are mainly derived from the theoretical basis besides the instructors/mentors' experiences. Meanwhile, inputs for in-service teachers are either from instructors/mentors or from other teachers' experiences participating in the training.

Pointing the theme, trainings for in-service teachers are more variative than those for pre-service teachers. As the main focus is learning how to be good teacher, language teaching methodology becomes the main agenda of the pre-service teacher training. On the other hand, in addition to updating teaching strategies, in-service teachers are also prepared to be able to combine language learning with other skills, such as the 21st Century skills or combining language learning and higher order thinking skills through HOTS-based language learning.

Almost all training programs at SEAQIL are "project-based" trainings. After joining a training program, teachers are asked to accomplish a certain project, among others, may be in the form of lesson plan; teaching materials, i.e., in the form of scripts, videos, digital content, or other creative forms; microteaching (video) simulation; research proposal; or even a compilation of best practices in language teaching. The basic idea behind this "project-based" approach is

that all teachers participating in SEAQIL training programs could directly apply the theory or concepts given by the instructors during the training. This approach also conveys benefits for the Centre as it can directly examine the theory or concepts introduced and relate it with the outcome products after the training. Moreover, the Centre can also make adjustment suitable to the teachers' needs and requirements.

To summarize this chapter, it should be noted that pre-service and in-service teachers have different needs or requirements. Furthermore, different needs or requirements demand different training designs. SEAQIL training designs are managed to meet respective needs of pre-service and in-service teachers and are planned to improve teachers' professional and/or pedagogical competencies. Above all, the Centre recognizes that the teacher professional development is very important to improve student learning outcomes. Achieving this goal is critical because the teacher's role is one of the most important factors contributing to students' successful learning and high-quality education.

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STEM Education: SEAQiM's Response during Covid-19 Pandemic for In-Service Teachers

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ABSTRACT

During the Covid-19 pandemic, an appropriate effort is needed to help teachers prepare for learning. SEAQiM views STEM education as a strategic alternative because it prepares students to have 21st century skills. In addition, STEM learning can also prepare teachers to carry out post-pandemic learning because STEM is an integrated, fun, and real or applicable context approach. Therefore, of the 8 regular course themes carried by SEAQiM, the STEM topic is of particular concern. Various forms of STEM-related programs have been carried out by SEAQiM for teachers in Southeast Asia, and have received good responses and results. The programs include Regular Course & In-Country Course on STEM in Math Education, Workshop on STEM+CT Learning Material, Workshop on STEAM Education Research, Workshop on STEM for Special Need Education Teachers, STEM Camp, Research Grants on STEAM, International Seminar on STEAM Education, SEAMETRICAL-STEM Edition, and STEM Village Activities.

Keywords: education, STEM, program, mathematics, In-service training

Introduction

The Covid-19 pandemic has had many effects on education around the world. According to UNESCO data, in April 2020, over 1.1 billion school learners were affected by the pandemic (at that time) with country wide school-closures affecting 117 countries (UNESCO, 2021); and there are over 55 million affected students, with country-wide school closures affecting 14 countries, at the time of writing this report (October 2021) (UNESCO, 2021, October).

A survey conducted by UNESCO and the IEA (International Association for the Evaluation of Educational Achievement) found that the COVID-19 pandemic disrupted education provision at an unprecedented scale, with education systems around the world being impacted by extended school closures and abrupt changes to normal school operations. (Meinck, Fraillon, & Strietholt, 2022). There are many limitations in the implementation of education

during the pandemic, including difficulties in the face-to-face learning process, limitations in the use of learning resources (including digital learning resources), limited learning and teaching activities due to COVID-19 affected teachers and students, and the closing of schools.

SEAMEO SEAQiM as a regional institution that has a mandate to improve the professionalism of teachers and mathematics education personnel in the Southeast Asia region, sees that there are many strategies and opportunities to reduce the impact of the pandemic on education through teachers, one of which is by introducing and improving the ability of teachers in STEM education.

Why STEM?

STEM education can contribute to increased problem-solving skills, critical thinking, and analytical thinking in students as well as lead to better real-world connections in the curriculum. (Brophy, Klein, Portsmor, Rogers, 2008; National Science Board, 2007).

According to Merrill (2009), "STEM teaching and learning focuses on authentic content and problems, using hands-on, technological tools, equipment, and procedures in innovative ways to help solve human wants and needs."

In general, here are some of the benefits of STEM education:

- Encouraging innovation and problem solving skill.
- Encouraging other 21st century skills.
- Relating to Real-World Problems & applicating knowledge.
- Builds Resilience.
- Encouraging teamwork.

To get all the advantages above, then STEM education should be presented in an integrative way and providing student with experiences where they apply knowledge and skills to personally meaningful and socially relevant real situations.

Type of (Regular) Course of SEAQiM

SEAQiM since late 2019 has had 8 course themes as its mandate. The last theme is the STEM Education theme for learning mathematics. Therefore, during this Covid-19 pandemic, SEAQiM faced obstacles as well as challenges to run programs related to STEM education. The following are the eight course themes at SEAQiM, which underlie various SEAQiM programs to improve teacher competence in Southeast Asia.

The eight themes for the SEAQiM course are applied to: 1. Regular Courses attended by teachers from Southeast Asia, and 2. In-Country Courses intended by the teacher community in one region (district, province, local government). The following is an outline, showing how over time, SEAQiM has implemented STEM Education in its programs and activities.

SEAQiM's STEM Program During Pandemic

During the pandemic, many programs related to STEM Education were carried out by SEAQiM. This is to introduce and familiarize teachers with STEM Education. Professional development experiences for in-service teachers could also provide a strong conceptual framework of an integrated STEM approach and build their confidence in teaching from an integrated STEM approach. (Kelley & Knowles, 2016).
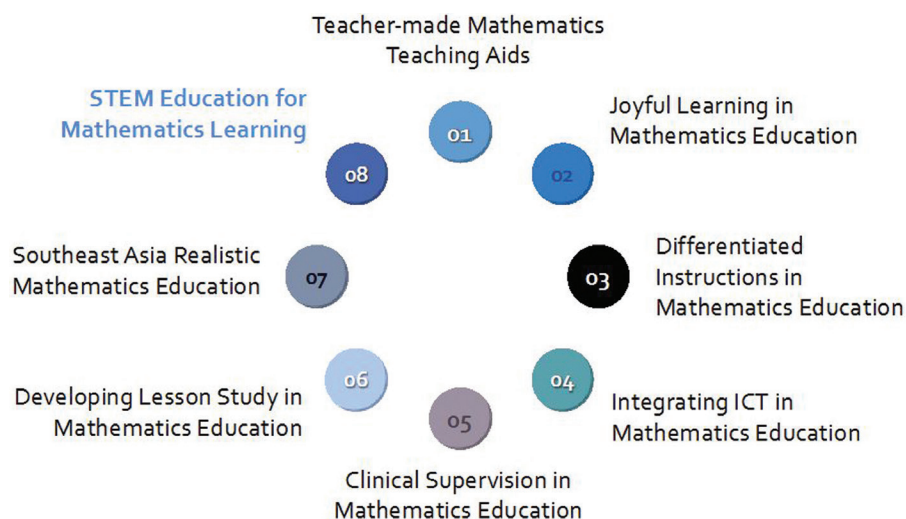
Figure 1. Eight themes of SEAQiM's Course
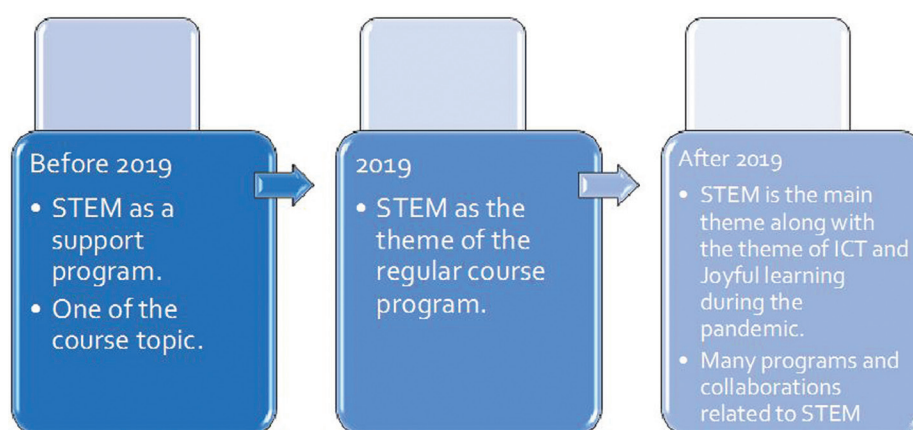
Figure 2. Broad Timeline of SEAQiM Program on STEM Education

A. Regular Course and In-Country Courses

During the pandemic, SEAQiM has held one Regular Courses and two In-Country Courses for STEM themes.

B. STEM Camp and Workshop

During the pandemic, SEAQiM also has several more specialized training programs related to STEM. Specific programs are known

Table 1. Regular Course and In-Country Course in STEM Education

No	Programme	Date	Place
1	Regular course on STEM in Mathematics Learning	9 – 27 October 2020	Online
2	In-Country Course on STEM in Mathematics Education for Primary School Teachers – Purworejo (Central Java)	27 September – 1 october 2021	Purworejo (Central Java)
	In Country Course on STEM in Mathematics Education for Primary School Teachers – "Sekolah Indonesia Luar Negeri" (SILN), 2021	15 – 19 November 2021	Online

Figure 3. Activities on online regular course and offline in-country course

as STEM Camps, where participants from certain communities or regions carry out face-to-face training activities (offline) that allow intensive STEM training both indoors and outdoors. Due to travel constraints during the pandemic, STEM Camp can only be done in Indonesia.

Workshops related to STEM Education were also conducted by SEAQiM. Workshops related to the development of learning materials (modules)

on STEM and Computational Thinking, which were held in a blended manner. Meanwhile, workshops related to STEAM Education Research are conducted entirely online.

C. Seminar, Research, and Publication on STEM Education

During the pandemic, SEAQiM also organizes seminars, research, and publications related to

Table 2. STEM Camp and Workshop on STEM Education

No	Programme	Date	Place
3	STEM CAMP for Junior High School Mathematics Teachers	27 September – 1 October 2021	Pemalang, Central Java
		25 – 29 October 2021	Purwakarta, West Java
		8 – 12 November 2021	Lombok, West Nusa Tenggara
		12 – 18 December 2021	Badung, Bali
4	Workshop on STEM + Computational Thinking Learning Materials	1 – 6 March 2021	Online (zoom) and offline (SEAQiM)
	Workshop on STEAM Education Research for Junior High School Mathematics Teachers	21 – 22 June 2021	online

Figure 4. STEM Camps activities
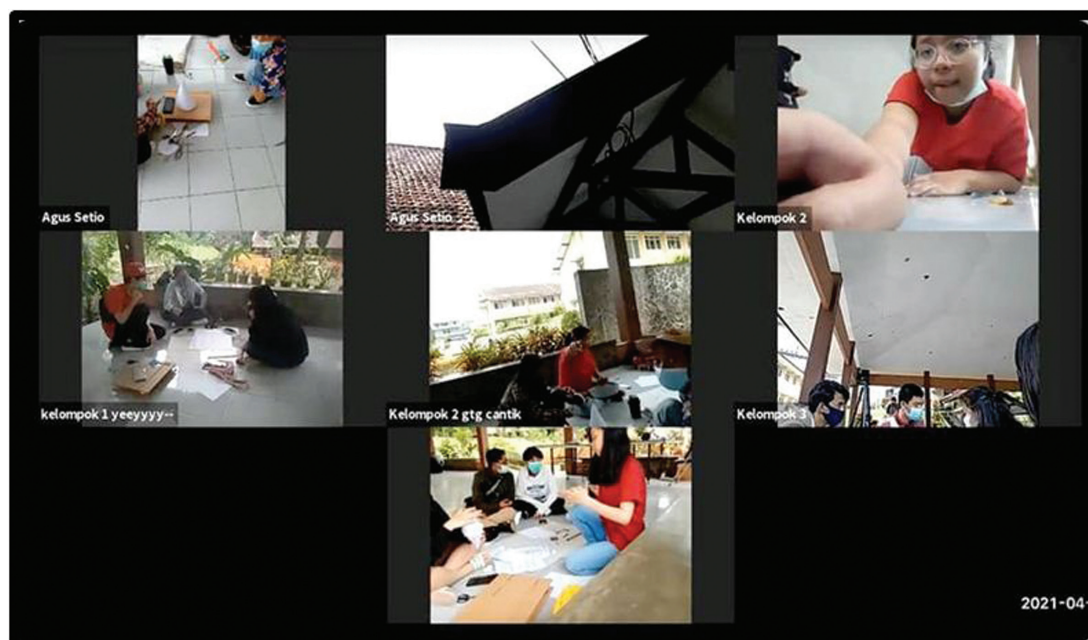
Figure 5. Trial-out activities about STEM+CT learning material prototype.

Table 3. STEM Camp and Workshop on STEM Education

No	Programme	Date	Place
5	International Seminar on STEM Education Research "STEAM as Innovation in Mathematics Learning"	1 – 3 December 2021	Yogyakarta
6	Research Grants SEAQiM 2021 on STEAM	July – November 2021	online
7	SEAMETRICAL – STEM Edition	December 2021	SEAQiM

STEM education. The following table lists the three types of activities.

We also publish the SEAMETRICAL Bulletin in edition of STEM Education.

D. Community Services Program

During 2021, SEAQiM is lucky to be able to organize activities for the teacher community (STEM-Holic Community) and the general public (Kampung Joho).

Program for the teacher community to help teachers develop research related to STEM education. While the activities in the STEM village of Joho, are to help children apply STEM in their daily lives and for their parents to help with activities that produce products with high economic value.

Impact of STEM Programs to Mathematics Learning

In implementing the STEM Education program for Mathematics Learning, SEAQiM manages activities that enable the improvement of mathematical abilities through the following things.

- Teachers are exposed to STEM activities with a focus on mathematics that are simple enough to be conducted with primary school students.
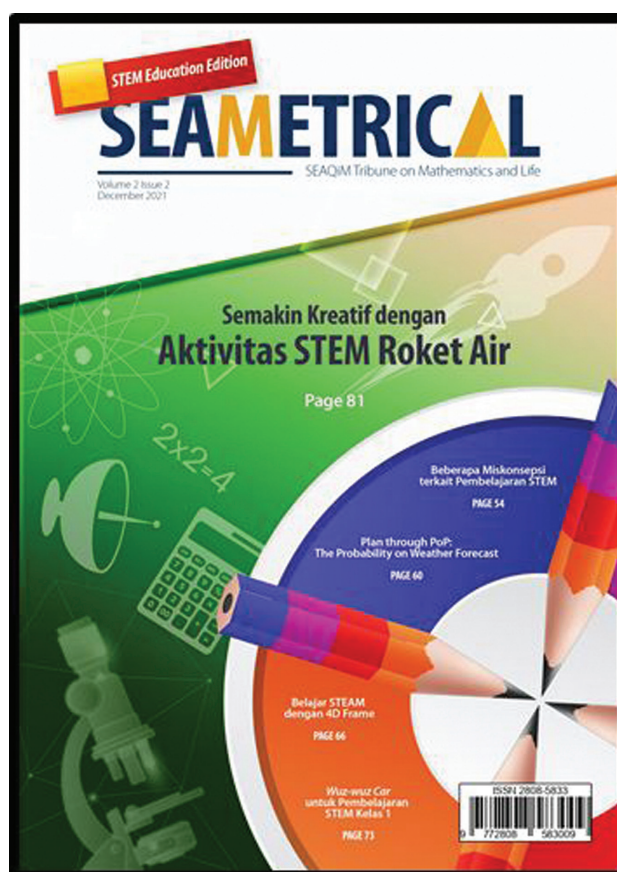
Figure 6. STEM Education edition for SEAMET-RICAL Bulletine

Table 4. Community Service on STEM Education

No	Programme	Date	Place
8	Programmes for Teacher's Community on STEM (STEM - Holic Community)	February – April 2021	online
9	Joho STEM Village	1 January – 31 December 2021	Padukuhan Joho, Condongcatur, Depok, Sleman, DI Yogyakarta

- We shared many kinds of STEM activities especially for children using low-cost materials as well as ready-to-use STEM kits. Through these activities, children learned and apply their mathematical knowledge to solve the problems and finish the project. It gives them different experiences on exploring mathematics.

- Creativity and innovation can be empowered and developed through STEM activity. These two skills are very important when they learn or solve problems.

- Teachers were happy to do the STEM activities. It could be the same with students. If students are happy when they learn, it can help student to enjoy learning, especially math.

- The SEAMETRICAL STEM edition bulletin is expected to be a reference and rich
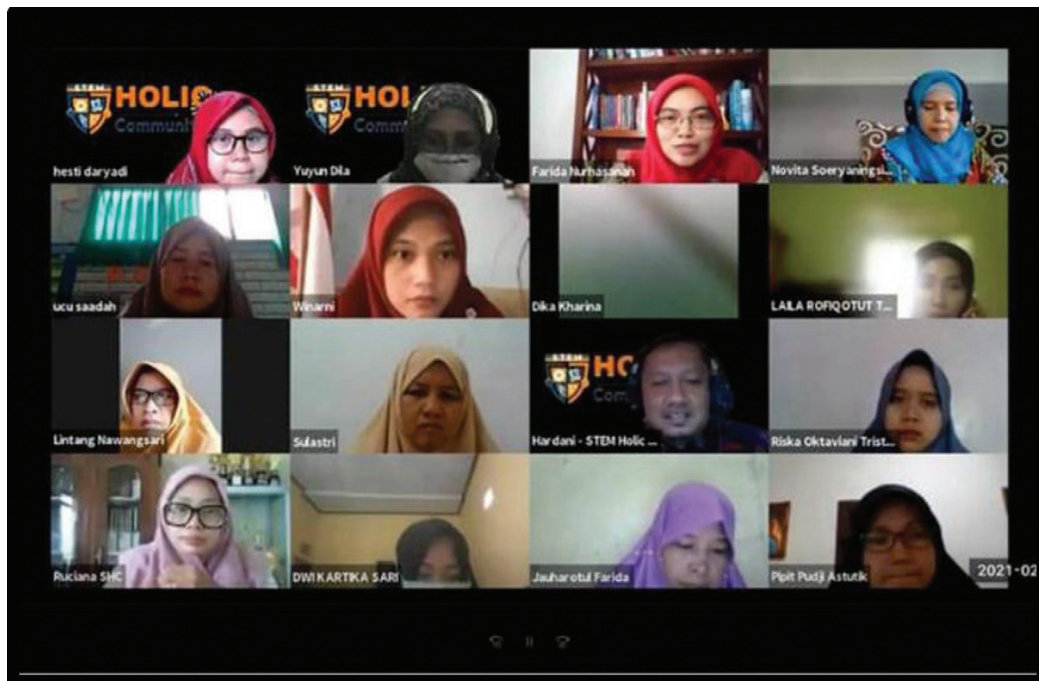
Training of Trainers: STEM-Holic Community

Figure 7. ToT for STEM-Holic Community (a teachers' community)

Figure 8. Activities for childrens and parents on Joho STEM Village

ground for discussion for STEM education as well as exemplary STEM activities that has been implemented by teachers in their mathematics classroom.

Some Result from Evaluation of STEM Programs

Based on the program evaluation questionnaire instrument given to participants during and after the activity, as well as the questionnaire given to the committee, the following results were obtained.

A. Good Practices and Challenges

1. Regular course on STEM in Mathematics Learning

Good practices:

- The experience of conducting a STEM teacher training in online setting.

Challenges:

- STEM activities are usually hands-on as well as requiring the participants to engineer their own products, work in group, and having discussion, so this is quite a challenge to organize in an online setting. We managed by maximizing the breakout room feature in Zoom, as well as using web based platform namely moddle & padlet.

2. In-Country Course on STEM in Mathematics Education

Good practices:

- Teachers could enjoy the STEM activities. After a long period, they were happy to offline session to explore hands-on activities. After the training, some of them implemented the activities with their students.
- Learning and sharing about STEM with SILN (Indonesian school overseas) teachers from seven different countries, each with different experience, classroom situations and challenges, as well as insights.

Challenges:

- Despite the training locations, larger space and safe environment must be settled. The training was conducted during the Covid-19 Pandemic where the situation was not safe. Another challenge is to provide the affordable STEM materials so that they can do the same things with students.

- Managing and maintaining attendance of the participants. The participants come from different countries with different time zone, with as much as 6-hour time difference from Indonesia, which makes getting a class full of people at one time can be really challenging, if not impossible.

3. STEM Camp

Good practices:

- Teachers could enjoy the STEM activities provided by the facilitators. After a long period not having face to face training, they were happy to offline session to explore hands-on activities. They enjoyed the session with an expert from Finland. After the training ended, some of them implemented the activities with their students.
- Get the latest information related to about STEM approaches in math learning. Get new knowledge about the theories that support STEM integration in math learning and STEM activities that can be implemented in the classroom.

Challenges:

- Training was conducted during the Covid-19 Pandemic where the situation was not safe. Another challenge is to provide the affordable STEM materials so that they can do the same things with students. Outdoor activity can be troublesome if the weather is unpredictable. We must check the weather forecast.
- Some facilitators couldn't attend the session offline (because the pandemic or the distance) & lack of internet connection.

- The duration of the workshop each day was quite long (start from 8 am until 6.15 pm)
- One of the facilitators delivered using English, and most participants were not fluent using English.

4. Workshop on STEAM Education Research

Good practices:

- Participants were introduced to STEAM and STEAM Research and updated about Research Methodology, especially in STEAM
- Participants were guided to create Research Proposal in STEAM
- Participants were introduced to the 4D Frame, a learning toolkit that can be used in STEAM learning and Experience Workshop.

Challenges:

- Some of the participants had an internet connection problem.
- Some of the facilitators used the Korean language in their presentation, so it was hard to understand.
- The unavailability of 4D Frame Toolkit for each participant, so they can't practice during the workshop.

5. Workshop on STEM + Computational Thinking Learning Materials

Good practices:

- In this occasion, we were able to try out the STEM+computational thinking activities we developed with junior high school mathematics teachers. We also discussed the lessons with them, got their feedback, and revised the lessons accordingly.

- The workshop is the first event with online-offline mode conducted by SEAQiM since the start of the pandemic in 2020

Challenges:

- STEM activities are very hands-on and require quite a lot of materials. Special arrangements need to be made for online teachers, since the committee cannot provide the required materials for them. As a solution, we explained very specifically the materials required for the activities and asked the teachers to prepare it themselves, which was later on reimbursed by SEAQiM.
- Managing online-offline event, especially during situations that require entire classroom interaction, such as group work and discussion.

6. International Seminar on STEAM Education Research

Good practices:

- This programme provides updated information about STEAM education and research.
- The teachers share best practices in innovating mathematics learning with STEAM.
- Gather opportunities for educators to foster collaboration and partnership.

Challenges:

- The duration of the seminar was quite long (start from 9 am until 4.30 pm), since it held in online mode.
- Some of the moderators and speakers had an internet connection problem.

7. Research Grants SEAQiM 2021 on STEAM

Good practices:

- Facilitate teachers in conducting research in STEAM learning.
- Facilitate teachers to communicate the results of learning innovation research through scientific activities and publications.

Challenges:

- The teachers had some difficulties in conducting the learning activity due to the Pandemic Situation.
- Some of the teachers are busy with their job in the school so sometimes it is hard to communicate with them.
- There is a grantee that can't finish the research grant agreement.

8. Publication SEAMETRICAL – STEM Edition

Good practices:

- Providing a publication platform for teachers to share their ideas and experience in STEM education.

Challenges:

- Short timeline. The team only got October to December (approximately 3 months) to assemble the bulletin. Therefore 3 months is a very pressing timeline.
- Writing quality vs content quality. Desk editors have to invest a lot of effort to work with the authors to improve the writings.
- Workload of editorial team members. Some editorial team members have to divide their time with other programs.

9. Community Service Program

Good practices:

- Joho STEM Village gives experiences to people on STEM activities. We share some STEM activities to Joho's people especially children and parents that relates to their daily activities. This program brings them new knowledge, experience and motivation.

Challenges:

- COVID 19 pandemic was the biggest challenge for this program. We must cancel and adjust some activities due to this situation.

B. Respons of Participants to STEM program

With a Likert scale questionnaire ranging from 1-4, each participant was asked to rate several aspects of the course/workshop program, i.e.

1. Organizing program
2. Content & delivery
3. Benefit of the program

Based on the post-course questionnaire, we get the following result:

1. Customer Satisfaction Index (CSI) > 0.9 (in 10-scale)
2. Activities and materials are useful and fun for participants.
3. Many participants hoped that there would be a continuation of the program.
4. Some hope that STEM activities can be directly related to the school curriculum.

Conclusion

Based on observations, program evaluation results and questionnaires given to participants,

here are some important notes related to the SEAQiM program regarding STEM Education during the pandemic.

- SEAQiM has many programs related to STEM and received positive responses.
- STEM education is interesting and useful for our participants.
- Program challenges are related to language, the internet connection, affordable materials, and health protocols.
- There is a need for improvement in follow-up programs and linkages with the school curriculum.

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SEAQIS' Efforts in Improving Science Teacher to Keep Learning Continuity During and Post Covid-19 Pandemic Era

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ABSTRACT

Covid-19 pandemic has resulted schools closure that affects hundred million students around the world. As a result, education has changed drastically where distance learning is the best option to be implemented. Therefore, it forced teachers to extremely adapt their learning approaches, methods, or learning media in delivering subject materials. They should apply various distance learning media to conduct distance learning effectively. In order to improve science teachers' competency to conduct science lesson during and post-pandemic era, SEAMEO QITEP in Science (SEAQIS) has conducted a survey to get the direct and factual data from the field. The survey was distributed online to 4676 respondents. Based on the questionnaire, learning method used in distance learning is dominated by giving projects, text assignments, and making videos. In addition, most of instruction are given through WhatsApp. Survey also figure out difficulties faced by teachers in establishing students' engagement caused by using of distance learning platforms or media which mostly optimise chat applications.

As one of efforts to overcome this challenge, SEAQIS developed training on implementing digital application on science learning which has been conducted several times. This training aims to improve teachers' digital literacy on using digital application that can be used to deliver science materials online. Through this training, teachers are able to maximize digital application from Google, Microsoft, or online assessments to develop lesson plan as well as to implement online science learning. SEAQIS realises that the implementation of distance learning will be more effective when teachers use interactive and interesting learning media. Thus, SEAQIS provides an opportunity for teachers to develop learning media through SEAQIS Research Grants programme. Through this programme, for approximately 10 months, teachers receive research guidance to develop their

proposed learning media. SEAQIS also has online, offline, and blended trainings focusing on two themes. The themes are training on STEM learning and training on integrating computational thinking into science learning. By organising the two trainings, teachers are expected to be able to implement online science learning which provides learning experiences for students to improve their 21st century skills. SEAQIS organises the SEAQIS webinar series as an online forum for teachers to disseminate their best practices on online science learning. The speakers are not only teachers but also education experts from various institutions presenting the latest science education trends and issues. SEAQIS believes that these excellent services can support teachers to conduct science learning during or post Covid-19 pandemic era.

Keywords: teacher support, distance learning, innovation, learning continuation

Background

2020 is an important year that marks a shift in learning and educational activities. The Covid-19 pandemic that has hit the whole world has forced governments to formulate policies that support the implementation of social distancing to minimise the transmission of the virus that attacks the respiratory system. Social distancing itself is defined as an action when one individual maintains a distance from another individual or takes a position relatively far to the other. This includes avoiding all kinds of gatherings or gatherings that involve many people at one time (Haqien & Rahman, 2020).

One of the significant impacts of the implementation of social restrictions on social life is the development of policies on activities at home. For example, Work from Home (WFH) is carried out by agencies and companies as well as the School from Home (SFH) policy is recommended by the Ministry of Education in Indonesia. Based on previous research from Livingston, it is stated that government regulations will greatly affect the implementation of learning by teachers because these regulations

educators/teachers is forced to adapt and change their teaching model as expected by the government. This statement is clearly proven during the Covid-19 pandemic where educators around the world need to drastically change the implementation of learning, from face-to-face learning to distance learning/online learning. With this change in learning activities, educators are required to adapt their teaching models, develop new learning strategies, and present material that can still be accepted by students effectively (Hill & Fitzgerald, 2020) (Livingston, 2018).

In the implementation, it is assumed that in several big cities such as Jakarta, Bandung, and Surabaya, educators and students already have the experience and ability to do Distance Learning (DL). However, in most other regions that have low levels of economic growth and human resources, learning with DL is considered as something unfamiliar and not prepared at all. For schools that are accustomed to use technological devices in teaching and learning activities, of course, they do not face many obstacles. However, this is not the case for

schools that have never implemented DL before, especially in areas with limited facilities both on the device and network side (Arifa, 2020).

Not only problems in terms of facilities in the implementation of DL, but there are also often obstacles or incompatibility with learning that should be carried out from the side of educators. There is a tendency to misunderstand that the teacher's responsibility in implementing DL is much lighter compared to traditional learning (Semradova & Hubackova, 2016). Whereas based on research conducted by Dursun, et al. (2013) the need to change learning strategies, limited equipment, personnel, resources, and limitations of educational technology, as well as the skills and qualities of teachers are common problems that need to be considered in the implementation of DL (Dursun, Oskaybaş, & Gökmen, 2013). This is also supported by research by Nurmukhametov, et al. (2015) which states that the use of internet/e-learning media has considerable obstacles, network connections, and technical errors such as server down and errors can hinder the success of learning (Nurmukhametov et al., 2015). (Sari, Muhammad Rifki, & Karmila, 2020)

Moreover, this DL activity is also a new learning experience for the majority of students. In the process, several online-based learning activities lead to a lack of effective learning for students due to the limited time the teacher has in explaining the material to the ineffectiveness of the question and answer session. Then there are also technical problems because not all students have smartphones and do not understand the operation of downloading assignments from educators. As quoted by Syaharuddin, S. (2020), many obstacles arise from students in online-

based learning, ranging from technical problems to questions about the learning process. The problems faced by the students, for instances, are poor internet connection, expensive cost in using internet, complicated operation of learning applications, as well as the lack of student's participation when learning takes place through applications (Syaharuddin, 2020). The implementation of distance learning also requires good communication between students, parents, and the school due to the limitations described above and it is not possible for students, parents, and schools to meet face-to-face during a pandemic (Sari, Muhammad Rifki, & Karmila , 2020).

In general, the implementation of distance learning during this pandemic is assumed to still require a lot of support from various parties in order to be carried out effectively. SEAQIS as an institution with the main task of improving the quality of educators and education staff feels they have a responsibility to participate in the success of the implementation of DL during this pandemic, starting with conducting a preliminary survey on the conditions of implementing DL to the obstacles experienced by all parties involved in DL activities, starting from teachers, students, schools to parents. It is hoped that this preliminary research can help SEAQIS to design programmes that are targeted at the needs of teachers and students to implement DL properly.

Methods

Research Design

The research method used in this study is a quantitative descriptive method. The research design focused on data collection with online questionnaires and quantitative data analysis.

The research was carried out in three stages, namely: (1) the preparation phase, (2) the implementation phase, and (3) data processing and analysis. Generally, the activities carried out are as follows.

1. Preparation

At this stage, three activities were carried out, namely the preparation and development of research instruments. The development of instruments includes preparation of instruments, validation of research instruments by experts, and revision of instruments.

2. Implementation

This stage is the stage of data collection. At this stage, questionnaires were distributed through the SEAQIS network through email, WhatsApp groups, SEAQIS social media, and others communication media.

3. Data Processing and Analysis

At this stage the researchers conducted data processing by using statistical software and remote sensing software. After the data collected, the programmes are designed to support teachers in pandemic era.

Participants

This research was distributed online and collected responses from 4674 respondents including principals, parents/guardians of students, teachers and students all over Indonesia.

Data Analysis

The data obtained from the results of the questionnaire carried out descriptive statistical tests, then divided into level and subject group, each group of respondents were classified and analysed separately. The distribution of respondents is presented by remote sensing devices. The entire data is then analysed to get an overview of science learning during the pandemic. Result of this mapping is used to formulate SEAQIS's programme to support teacher to keep learning continuity during and post Covid-19 pandemic.

Result and Discussion

Participants Demography

The questionnaire was collected through an online platform using Google Form (https://s.id/surveyqis) from 12 June to 12 July 2020. The survey conducted to find out several things, including the readiness of teachers, principals, students, as well as parents/guardians of students to carry out learning in the new normal era. To further dissemination, the questionnaire was distributed using a WhatsApp group and forwarded from group to group to expand the reach of the survey.

4674 data were collected from the questionnaire. The respondents included principals, parents/guardians of students, teachers, and students all over Indonesia. However, the distribution of respondents is not homogenous and dominated by the respondents from Java (Figure 1, the area with the most respondents has a deeper colour).

Figure 2 and 3 are presented the respondent's status and educational level. The number of respondents who participated was dominated by students, especially high school students, while there were only a few high school
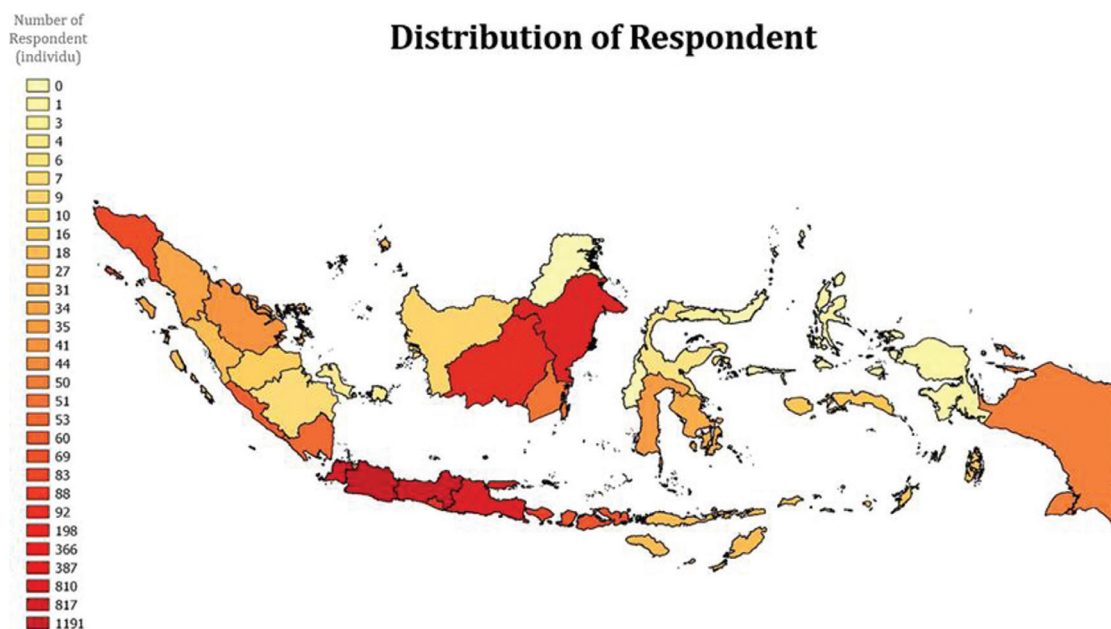
Figure 1. Distribution of Respondent
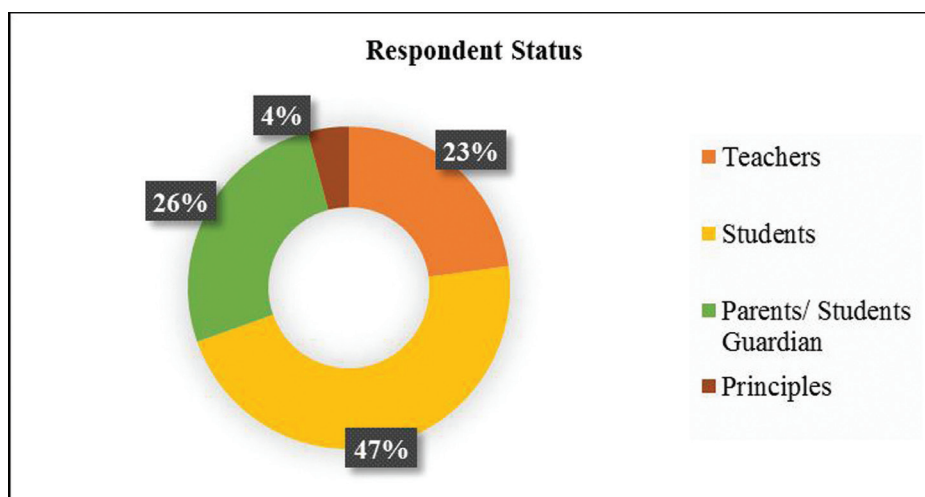
Figure 2. Respondent Proportion based on Status
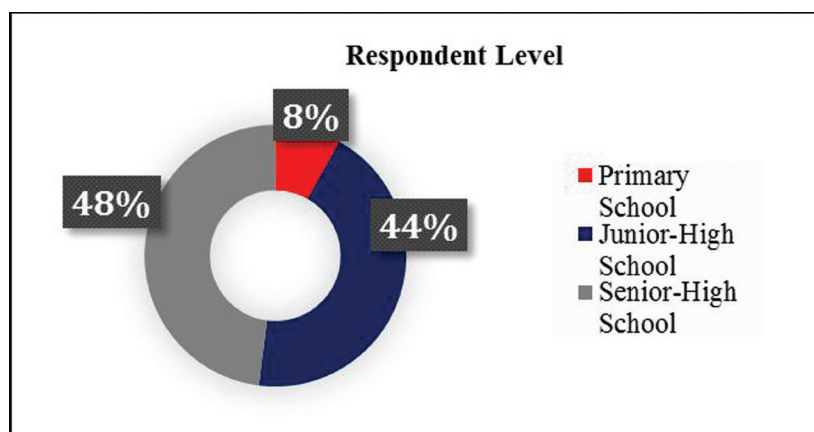
Figure 3. Respondent Proportion based on Educational Level

principals who participated. From all categories, the number of principals is seen to be the least, this is considered as a normal distribution since one principal supervises several teachers and many students.

Data Analysis

Readiness of School Health Facilities

Most of the teachers and principals involved in the survey reported that the school where they were assigned did not meet the requirement of health protocol facilities (Fig. 4). The readiness of health protocol facilities was low at the junior high and elementary levels where 61% of teachers reported that their schools had not met the health protocol facilities requirement. At the SMA/SMK (upper secondary/vocational level), the readiness of school health protocol facilities has the highest readiness. There are 73% of principals and 53% of teachers who have the highest readiness. However, the survey was conducted in June-July 2020 when the information and support of health facilities in school is still in dissemination process. In 2022, the health facilities protocol in school are assumed to be more well-prepared. When the survey is conducted, the bare minimum of school health facilities/protocols are providing facilities for hand washing using soap and water or alcohol-based hand sanitizer; cleaning the room and school environment regularly (at least once a day) with disinfectant; and conducting initial screening in the form of measuring body temperature for all guests.

Dissemination of Health Protocols

Most school principals have disseminated health protocols to school residents, 83% of school principals have disseminated this information. Unfortunately, the acceptance and understanding of health protocols in schools by teachers, students, and parents is still considerably low (Fig. 5). Related to the dissemination, there is a data discrepancy between the principals' acceptance compared to teachers', students', and parents'. 83% principals stated that they already disseminated the health protocols to the schools communities but only 65% of teachers admit that they have received
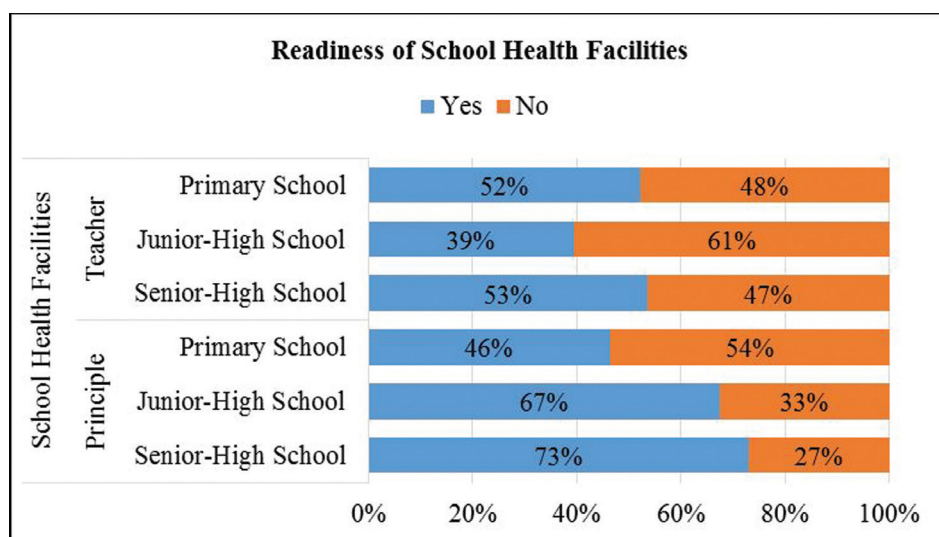
Figure 4. Principals and Teachers Survey for Readiness of School Health Facilities

information of health protocols at school. In terms of understanding and acceptance, the situation is getting worse at the student level. Despite the information that students have received the information of health protocol at school, students' understanding and acceptance toward health protocols in schools are the lowest compared to teachers' and principals.

Learning Process in Pandemic

Most of the science teachers as respondents said that DL was not effective. There are only 8% of teachers who consider that DL is effective to conduct. The ineffectiveness of DL cannot be separated from the obstacles experienced in its implementation. The big point in DL's obstacles lies in the availability of facilities and infrastructure such as online learning tools and the internet as well as the difficulty in establishing learning engagement with students. Students who are getting bored do not pay attention and even behave impolitely to their teachers in the implementation of online learning.

The difficulty of engagement establishement is reflected in the use of distance learning media, which mostly use chat application media (WhatsApp and SMS) and rarely use LMS (Fig. 6). The use of online quizzes is also very minor. The learning videos that have been provided are not widely used. Based on the data, not more than half of the teachers as respondents who use the learning videos that have been provided on platforms such as YouTube or *Rumah Belajar*. It is quite surprising that there are almost 5% of teachers who still use SMS as a distance learning medium while the Ministry of Education and Culture only provide internet quota for teachers to help them in conducting DL which cannot be used to send SMS.

Not only the media that dominated by chat applications which not really support students' learning experience. The methods used by teacher also dominated by students' centred approach with very limited intervention from teacher. In classroom situation when teacher can interact directly with students, the student
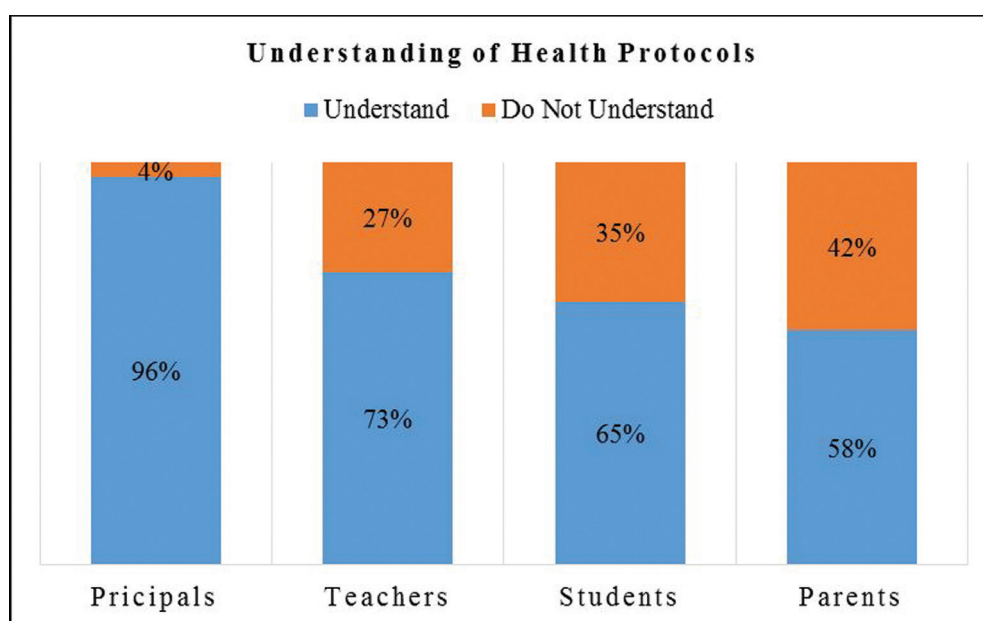
Figure 5. School Communities' Understanding of Health Protocols
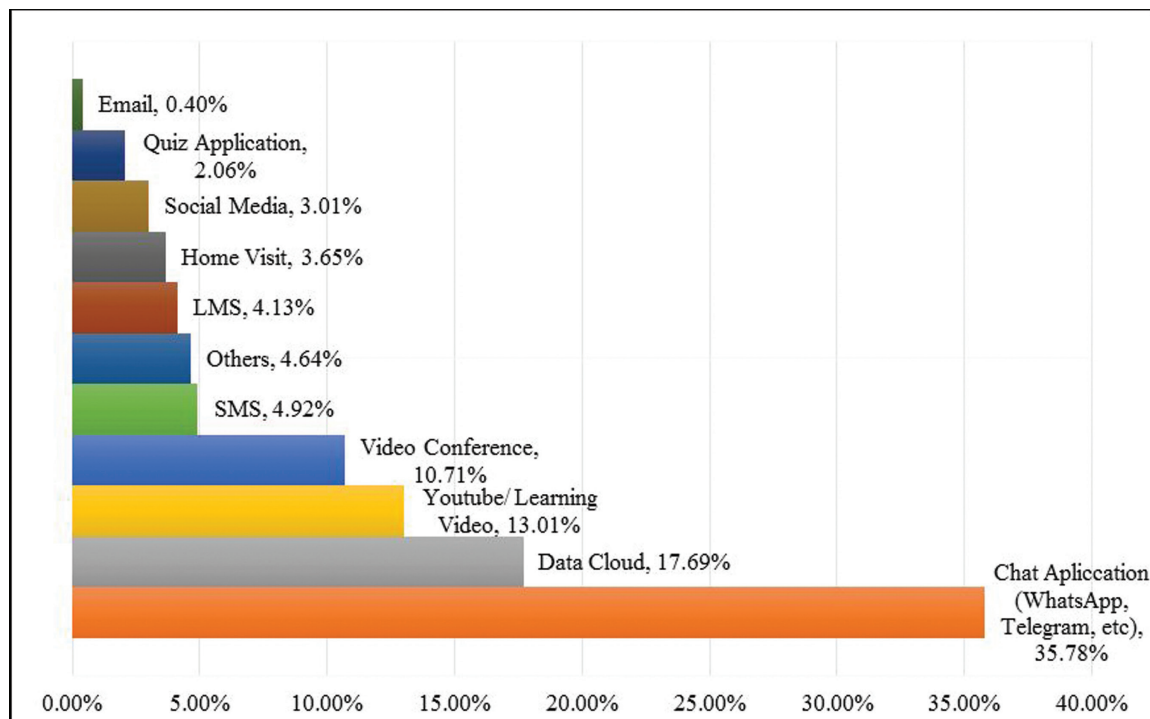
Figure 6. Media Used in Distance Learning
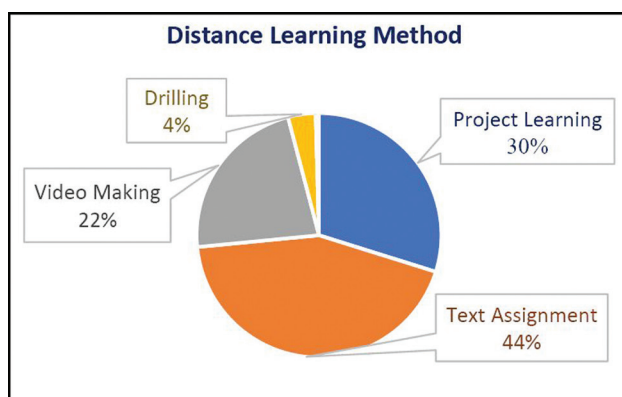
Figure 7. Methods Used in Distance Learning

centred is favourable. But in the term of distance learning when students' need more guidance sometimes this approach is not effective. The learning methods used in distance learning are dominated by giving projects, text assignments and making videos. Giving text assignments such as summarising the videos given or explanations that have been delivered can indeed be used as evidence that students pay attention to the teacher, videos or other forms of material

that the teacher has provided. Based on the pie diagram (Fig. 7), virtual practicum, online games, and online discussion are very rarely used as the DL method (less than 1%). This is really worrying, because there is very little use of virtual labs, which even before the Covid-19 pandemic hit, were accessible for free (Fig. 7).

The next question focuses on science teachers' perception on what subject/materials is considerably easier and harder to explain in DL. There are 204 science teachers questioned the difficulty to conduct a materials that required a practicum, while another 169 felt that all materials could be delivered in DL mode. There is a clear discontinuity in the survey results, where 169 out of 920 respondents said that "everything is possible" while the other 751 teachers had difficulty in delivering material to students online. This means that there is information or teaching techniques that are unknown or not conveyed to the other

751 respondents. Practical work and practicum being the type of materials that were chosen the most as materials that are difficult to convey online, indeed online students are not as free as offline learning to take advantage of school facilities in carrying out practical activities such as laboratory equipment and teachers' support. However, for the introduction of concepts, teachers can use virtual labs that have been provided by several institutions for free, unfortunately the use of virtual laboratories cannot be used to improve students' practical skills. It is quite worrying that other materials can be delivered without practicum, such as the concept of moles, waves, cells, as well as the materials that required calculations, which have many ways to teach them.

To support this problems, the questionnaire was designed to figure out the teachers' expectation on supports that SEAQIS can provide. The types of support that teachers expect from SEAQIS include content that contains learning videos as well as virtual laboratories, training on the use of IT and online learning applications, pedagogy training such as STEM training on distance learning and tips for distance learning that are not boring for students. It is unfortunate that some teachers actually expect the health equipment assistance from SEAQIS which is not SEAQIS' work area. Regarding to the video content and virtual laboratories, there are actually many available online and free from home learning platforms such as YouTube, PhET, as well as Go-labz. The virtual lab provider platforms such as PhET even provide how to use virtual lab worksheets in various languages, some of which have been translated into Bahasa. Considering the high demand for virtual content and its unsuitable availability, it is suspected that there is a lack of literacy regarding digital learning content among science teachers. In response to the lack of literacy regarding digital learning content among science teachers, SEAQIS has held various trainings on online learning in collaboration with related agencies, foundations and institutions which are presented in the next section.

SEAQIS' Efforts in Improving Science Teacher to Keep Learning Continuity

SEAQIS has an important role to improve teachers and education personnel in Southeast Asia. As a centre of excellence, during the fiscal year 2020/2021 and 2021/2022, SEAQIS has developed two innovative programmes namely Integrating Computational Thinking into Science Learning Programme and Innovation on STEM Immersion. Moreover, to support teachers to keep learning continuity, SEAQIS has conducted several activities, which are:

1. **Conduct webinars with various themes to support the implementation of distance learning and increase educators' knowledge.** In response to Covid-19 pandemic situation, SEAQIS organise a number of webinars to improve science teachers and education personnel competencies in Southeast Asia. There are 25 webinars with various theme that conducted by SEAQIS from July 2020 until June 2021. The webinar attended by more than 5000 participants.

2. **Conducting the training on distance learning application. (Google Classroom, Google Meet, Google Form, etc.).**

Referring to the data collection, most teacher is using chat application as learning methods. SEAQIS provides training to improve teachers' ability in organising DL with introduction of learning application such as LMS, online quiz application, and video conference application. The training is conducted online and offline for teacher in Indonesia.

3. **Conduct the SEAQIS Research Grants with the theme: innovation of learning in pandemic era**. SEAQIS Research Grants (SRG) 2020 and 2021 were held as an effort to improve competency of primary to secondary science teachers in Southeast Asia countries, especially in research field. The improvement of the competency is expected to have positive impact to the teachers and the quality of education. Due to Covid-19 Pandemic, in 2020 and 2021, the SRG was held online. There were more than 150 proposals submitted to SEAQIS, 40 and 50 proposals were accepted as SRG 2020 and SRG 2021 grantees respectively.

4. To support training course and remote learning implementation, **SEAQIS produced teaching and learning materials**. There are ten modules and four learning videos that can be used as learning resources.

Based on the survey findings, SEAQIS meets the challenges by conducting several programes. They are: 1) training on implementing digital application on science learning to improve teachers' digital literacy on using digital application in online learning and its assessment; 2) developing learning media through SEAQIS Research Grants programme; 3) training on STEM learning and integrating computational thinking into science learning to provide learning experiences for students to improve their 21st century skills; 4) webinar series as an online forum for teachers to disseminate their best practices on online science learning. The authors were enriched by education experts from various institutions presenting the latest science education trends and issues.

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Learning Through Making – A Proposed Sustainable Education

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ABSTRACT

The COVID-19 pandemic has taken a heavy toll on practically every facet of society, including schooling. However, teachers are willing and able to cope as online educators despite their lack of experience with online teaching. It is vital to transit to a thriving stage of remote teaching, learning, and teacher education as we go past the survival phase of online teaching and learning. A new paradigm for learning and teaching is needed due to the current struggle to keep pace with the disruptive nature of technological and social change. We need a pedagogy that leans into the future, inclining towards what is arising and might be needed rather than resting securely in the understanding and skills of yesterday. We propose making, a process of creating something, as a sustainable type of learning as it can retain the acquired knowledge and skills after initial exposure. It involves making the best use of available resources to support a healthy existence and ensuring a viable future for all. Sustainable learning attempts to equip learners with knowledge, skills, methods, tools and dispositions to create and sustain conditions whatever their endeavour and wherever they work. Making allows students to take on multiple roles as mathematicians, scientists, designers, or makers, guiding the knowledge, skills, and practices to solve issues. Making enables learning to be more relevant and meaningful as it features a learning-by-demand model. Making also encourages learners to understand what makes technology work, rather than be satisfied simply consuming technology. Learning through making is a continuous, enduring and proactive learning as it does not focus on the accumulation of knowledge and skills but more on building resilience, responsiveness and change-readiness capabilities. Through making, learners learn to anticipate challenges and opportunities that might arise and develop and prepare by choice and design, leading to learning and innovation, rather than being held hostage to change and environmental turbulence. One of the central aspects that sustain learning is values and ethics. Learners should be aware of the making process, intention and purpose, cost, and consequences to the environment. It should not be purely based on profit and short-term relief

but because it is needed, beneficial and has no long term negative effect on the environment and humanity.

Introduction

The Covid-19 outbreak caused substantial upheaval in many educational institutions' usual teaching procedures. Schools, colleges, and institutions worldwide were forced to close for weeks or months, forcing 1.37 billion pupils to stay home. Educators were expected to become online instructors in a matter of days. Many issues developed as educators moved from traditional face-to-face learning to digital platforms for remote teaching, requiring swift responses and policy and procedure adjustments to deliver equitable and acceptable remote learning to all students. Parents juggled work demands to ensure their children had access to instruction from home. Students struggled to stay engaged and connected with their teachers and peers online as school leaders and teachers rushed to completely redesign their educational delivery models.

Many educators displayed agency in this case, which refers to the capacity for teaching given the resources and restrictions of the working environment and takes into account instructors' personal views, values, and characteristics (Gudmundsdottir & Hathaway, 2020). Teacher educators responded quickly to the need to prepare for teaching in a COVID-19 future, doing what they do best: figuring out how to respond to support in-service teachers' professional development successfully.

Despite that many teachers are willing and able to cope as online educators despite their lack of experience with online teaching, it is vital to transit to a thriving stage of remote teaching, learning, and teacher education as we go past the survival phase of online teaching and learning. A new paradigm for learning and teaching is needed due to the current struggle to keep pace with the disruptive nature of technological and social change. We need a pedagogy that leans into the future, inclining towards what is arising and might be needed rather than resting securely in the understandings and skills of yesterday. We propose making, a process of creating something, as a sustainable type of learning as it can retain the acquired knowledge and skills after initial exposure. It involves making the best use of available resources to support a healthy existence and ensuring a viable future for all.

This paper will describe briefly sustainable learning education (SLE) and learning through making or maker-centered learning. This is followed by a proposal of making as a type of sustainable learning education, which can withstand disruptive changes and lean towards the future. In addition, two maker-centered teaching and learning training programmes that SEAMEO RECSAM carried out will be described.

Sustainable Learning Education

Sustainable learning education (SLE) is defined as knowledge retained after initial exposure and may include a "learning to learn"

process (Hays & Reinders, 2020). It is based on establishing, developing, and maintaining humans' learning processes (Graham, Berman, & Bellert, 2015). This differs from teaching for sustainability or sustainable learning, which focuses on retaining and renewing the earth's resources. Sustainable learning or pedagogy is content-specific, imparting knowledge and understanding of a sustainable world. On the other hand, SLE refers to curricula, teaching, and learning methods that provide the knowledge and skills to maintain learning in different circumstances (Ben-Eliyahu, 2021). Continuous, deliberate, responsive, and proactive learning are all components of sustainable learning in which the learner effectively builds and rebuilds her or his knowledge and skills foundation as circumstances change (Hays & Reinders, 2020). It is similar to lifelong learning in this way. However, when compared to lifelong learning, sustainable learning is differentiated by conscious and intentional learning in the present amid an ongoing flow of circumstances and developing possibilities (Hays & Reinders, 2020). It aims to equip learners with knowledge, skills, methods, tools, and dispositions to create and sustain conditions whatever their endeavour and wherever they work (Graham et al., 2015).

Hays and Reinders (2020) identified numerous characteristics of sustainable learning education (SLE). Firstly, it is less regimented and "fixed" than traditional education, and it operates more spontaneously and responsively. Sustainably learning education evolves, integrating sustainability concepts and goals into its design and delivery. It may also be described as a type of pedagogy that looks to the future, focusing on what is needed rather than relying on yesterday's knowledge and skills. It seeks to learn in the present, creating 'learning moments', rapidly adapting and disseminating the learning in a recurring and quickening cycle. Sustainable learning education emphasises self-sufficiency, consciousness, and sustainability. A sustainability curriculum should aspire towards self-sufficiency and consciousness in design, delivery, and outcome. It is self-sustaining and self-governing, requiring few external resources. Apart from that, it is based on and produces consciousness – vigilant attentiveness and mindfulness, constant awareness of internal and external conditions, and continuous evaluation of the effectiveness of one's actions in the world, all filtered through the lenses of ethics, responsibility, and sustainability. Finally, it provides learners with a commitment to consciousness and the willingness to act on relevant observation.

SLE is aimed to equip learners with skills and strategies through inquiry, self-assessment and evaluation to sustain learning throughout life as the world changes. Ben-Eliyahu (2021) listed the components of SLE: active learning, future orientation, independent learning, collaborative learning, relearning, and transferability. It teaches learners to be open-minded, inquire, reuse, renew, and rebuild to cope with the ever-changing technologies and circumstances that require learning and relearning.

Learning Through Making

Making is a term that encompasses a wide range of activities that involves constructing, deconstructing, or remixing of the products

(Daugherty, 2013; Martinez & Stager, 2019; Sheridan et al., 2014). Examples of making activities are woodworking, cooking, welding, robotics, construction, programming, and physical computing. It involves the personal and hands-on nature of building or adapting objects for the simple pleasure of figuring out how things work (Honey & Kanter, 2013). To date, many making activities are associated with the maker movement or makerspace, and many focus on working and learning with technology (Daugherty, 2013; Martinez & Stager, 2019). Martin (2015) conceptualised making as a class of activities focused on designing, building and modifying material objects for playful or useful ends. It is oriented towards making some product that can be used, interacted or demonstrated. He further described that making often involves traditional craft and hobby techniques such as woodwork and sewing. It also often involves using digital technologies such as laser cutters and 3D printers.

Students who participate in making activities can take on various roles such as scientists, designers, or mathematicians, who use applicable knowledge, skills, and practices to address challenges in the making process (Martin, 2015). Applying various tools in the making process, such as 3D printers, soldering irons, and software engages students in hands-on learning and problem solving and helps them acquire technological and computational literacy (Kafai et al., 2014). Students are encouraged to let their creativity be guided by their interests and abilities, promoting autonomy and control. It emphasises learning-on-demand, which makes learning more relevant and meaningful, rather than a set curriculum that may or may

not is used later (Gershenfeld, 2007). Martin (2015) listed several reasons why making is a valuable learning activity. Making aligns with many STEM education features, especially the engineering practices. It also provides learners opportunities to learn technological tools for building and thinking. In making, learners learn from the actions of their creations, learning driven by recursive feedback. The playfulness and experimentation in making, leads to the development of conceptual knowledge and promotes adaptability in the face of challenges. Apart from that, making advocates a growth mindset, where anyone can learn the skills needed to complete any project they can imagine given the effort and resources.

Making as a sustainable learning education

In schools, making can be carried out as activities for project-based learning for science and mathematics in the classroom. Besides, it can be carried out as after-school or co-curriculum activities to complement the classroom teaching and learning. There are many making activities related to makerspace or maker-centered projects carried out in school documented such as described by Blackley, Rahmawati, Fitriani, Sheffield, & Koul (2018), Hsu, Baldwin, & Ching (2017), Kafai, Fields, & Searle (2014) and Valente & Blikstein (2019). However, one of the significant challenges of learning online during the Covid-19 pandemic, especially in teaching and learning science, is the difficulty of carrying out hands-on science experiments and projects. Teachers and students cannot access the school facilities such as laboratory, computer laboratory and workshop to use the tools and materials.

Nevertheless, making is an activity that can happen anywhere and anytime. It can take place at home and encompasses various interest-based activities such as cooking, baking, sewing, woodwork, robotic, electrical, electronics, programming, metalwork, and more, using the available resources and material. It can be a sustainable learning experience since it entails deliberate and intentional learning in the present amidst a constant flow of changing situations and opportunities (Hays & Reinders, 2020). The process of making engages the learners in hands-on learning and problem solving and further equip them with knowledge and skills that can be retained (Graham et al., 2015). The problems encountered during the making process can be valuable 'learning moments,' in which learning occurs in a cyclical and accelerating manner (Hays & Reinders, 2020). Making can be a learning activity that can happen throughout our lifetime. It can withstand the ever-changing external environment and circumstances as it involves modes of thinking, creating and problem-solving skills which are skills and strategies to sustain learning. It also involved the active learning notion of renewing and relearning relevant knowledge and strategies during the making process (Ben-Eliyahu, 2021).

In-service Teacher Professional Development

In considering making as one type of sustainable learning education and its benefit in the educational context, there is a growing trend of the maker movement and emerging digital fabrication technologies (Jones, Cohen, Schad, Caratachea, & Smith, 2020; Vossoughi & Bevan, 2014). Educators are beginning to adopt making activities in teaching and learning,

which involves building and testing devices and applying them for purposeful courses (Vossoughi & Bevan, 2014). Making activities are increasingly integrated into formal educational environments, especially hands-on and project-based learning in various subjects. Thus, there is a need to design and implement professional development related to making and integrating making activities into teachers' practices to support students' learning.

Because of that, SEAMEO RECSAM conducted several in-service teachers' training or professional development programmes on learning through making during the Controlled Movement Order (MCO) due to Covid-19 Pandemic here whereby schools were closed, and most of the people were required to stay at home. In November 2018, the STEM Planning and Design Learning (PaDL) Framework was conceptualised during the Teaching to Transform week-long regional workshop organised and conducted by SEAMEO RECSAM with collaborators from Monash University Australia The STEM PaDL Framework consists of two models – one for Teacher Lesson Planning and one for Student Design Learning. The Teachers Planning model comprises four stages, namely: create enthusiasm, planning, design learning process and reflection. On the other hand, the four in the Design Learning process model for students are empathising, developing design ideas, prototyping/modelling, and proposing solution. Diagram 1 presents the summary of the STEM PaDL framework.

Two Training of Trainers (TOT) workshops were held to evaluate the STEM Planning and Design Learning (PaDL) Framework. The first workshop, which included eight RECSAM
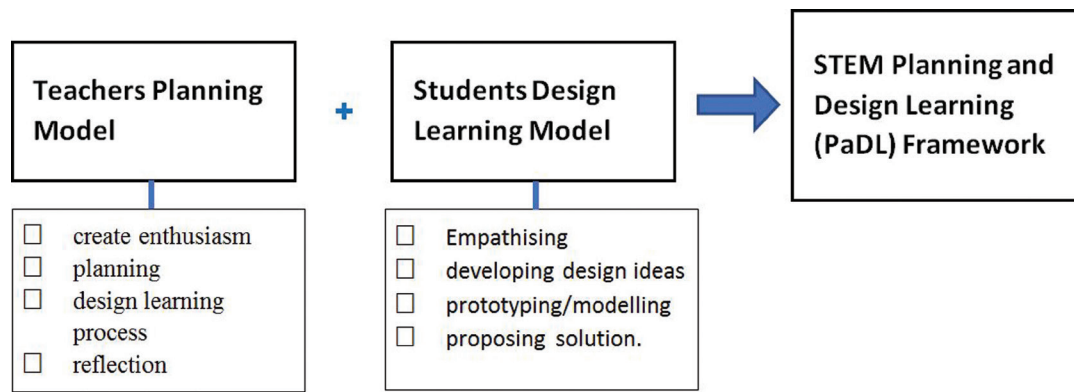
Diagram 1: STEM Planning and Design Learning (PaDL) Framework

Science Specialists, was held on April 6 and 8, 2021, while the second workshop, which included a group of science and mathematics teachers from one of Penang's schools, was held on April 20-21, 2021. This group of teachers made up the Lesson Demonstration Team, which took part in an online school tryout. "Used Face Masks: A Waste Management Crisis" is a lesson exemplar prepared by the Demonstration Team. This theme was chosen to highlight the real-life social and health issue of students in Penang Island and Malaysia dealing with abandoned face masks during the COVID-19 outbreak. The science, mathematics, and design teachers used the Google Meet platform to conduct an online trial run activities session with the students for two days. The Demonstration Team devised the instructional sequences for each session. Due to the home learning, the students attempted to find solutions by developing a sketch to gather used face masks distributed over the neighbourhood. Diagram 2 exhibits examples of student sketches created during the online class. During the prototyping and modelling stage, the students construct the prototype based on the sketch, using materials easily available in their house. Diagram 3 shows examples of the prototype constructed by the

students during the class. The results of this research are currently being published in one of the education journals.

Teachers can freely modify the STEM PaDL framework until it works in their context and environment because it is only suggestive rather than prescriptive. Educators can use this framework as a guide to conduct STEM-related making activities with students during formal teaching and learning.

SEAMEO RECSAM also conducted a workshop on 'Learning Through Making – An introduction to STEM Makerspace' for in-service educators. This workshop aimed for educators to experience making activities or maker-centered projects on electric circuits, a common topic in lower secondary science. Educators had hands-on experience in soldering skills used in many electrical and electronic projects. Finally, they designed a level-appropriate maker-centered project that applies their science content. A special feature of this workshop was introducing 3D printer in making and designing a simple electrical product. Teachers were exposed to basic skills in 3D printing as this is one of the widely used fabrication technologies in the current educational context. Diagram 4, Diagram
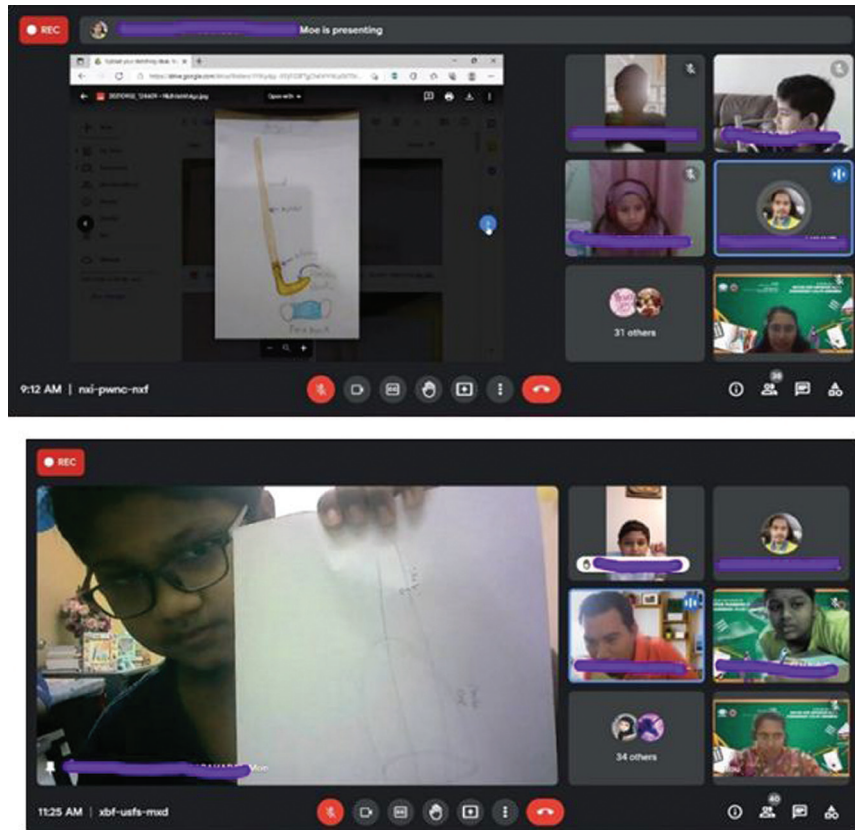
Diagram 2: Students' sketch of the design of the solution in the online class

Diagram 3: Students constructed the prototype based on their sketch

Diagram 4: Participants practising the soldering skills

Diagram 5: Participants create simple electrical products from recycled material

5, Diagram 6 and Diagram 7 show some of the making activities and product during the training for 'Learning Through Making – An introduction to STEM Makerspace'

Conclusion

One of the central aspects that sustain learning is values and ethics. Apart from all the learning benefits of making activities, it can also inculcate values central in all learning processes. Educators or parents can intentionally make aware of the making process to the learners, its intention and purpose, cost, and consequences to the environment. It should not be purely based on profit and short-term relief but because it is needed, beneficial and has no long-term negative effect

on the environment and humanity. Making is a learner-centered participatory activity that does not focus on teacher-centered information presentations (Jones et al., 2020). For educators to effectively implement making activities in class or after school, they must first experience maker-centered learning activities. SEAMEO RECSAM seeks to provide in-service teachers with opportunities to engage in the making process especially aligned with project-based learning in science and mathematics. Besides, we hope to investigate the impact of making activities in science project-based learning in the classroom and online teaching and learning. We also intend to evaluate the strengths and problems to formulate the right interventions in future training on making activities for educators. We hope that learners of all ages will

Diagram 6: Exploring 3D printing

Diagram 7: The 3D printed electrical product from the participants

engage in making as one way of learning in all circumstances and throughout their lifetime. Indeed, learning through making can be one way of sustainable learning education, not only equipping learners with the 21ˢᵗ-century skills but also inculcating values and ethics that are much needed in this age

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Innovations in In-Service Teacher Training during the COVID -19 Pandemic at SEAMEO RETRAC in Vietnam

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ABSTRACT

SEAMEO Regional Training Center (SEAMEO RETRAC) is a regional training center located in Ho Chi Minh City, Vietnam and among its missions is to offer in-service teacher training in Vietnam and the Southeast Asian Region. During the two years of the COVID-19 pandemic, SEAMEO RETRAC had to quickly transform its operation and training modality to ensure the implementation of the training curriculum and at the same achieve the quality of the training programs. Lots of innovative changes have been applied to in-service teacher training at the center. This paper will describe how SEAMEO RETRAC responded to the challenges caused by the pandemic in order to implement teacher training programs in Vietnam and the region. This paper will also present the good practices regarding innovation in teacher education and at the same time indicate lessons learned from exercising innovative educational platforms for teacher training during the pandemic. Policy recommendations will also be provided to enhance in-service teacher training in the post-COVID-19 pandemic, taking into consideration the opportunities brought about by the innovation.

Keywords: teacher training, innovation, online teaching, online teacher education, in-service teacher training, SEAMEO RETRAC

Introduction

Started from the begining of the year 2020, the COVID-19 hit many countries in the world including Vietnam. Most countries in the world experienced unprecedented total or partial lockdown which led to immediate school closure (Florer & Swennen, 2020). Teachers and students had to learn how to adapt to remote teaching and learning and this is also true for teacher education. Accoring to Allen, Rowan and Singh (2020), teachers and teacher educators are transitioning through an uncertain time in their profession and their lives and the rapid move to online mode of delivery has led to significantly intensified workloads for them.

In the context of the COVID-19 pandemic, teacher education has to adapt to the situation of restriction in physical interaction in classroom activities as well as teaching practicum. Teacher education had to move to new ways of teaching and learning to prepare teachers for a world marked by uncertainty (Flores & Gago, 2020). Among the issues caused by the COVID-19 pandemic are the learning loss and unpredictable combinations of online learning, blended learning and classroom learning. The need for a comprehensive view of online education which integrates digital technology to support teaching and learning has become more important than ever (Flores & Gago, 2020).

In many higher educational institutions and schools, teachers and students were not really ready to adapt their teaching and learning with digital technology. This happened to teacher education including in-service teacher training. The transition from face to face to online teaching has experienced pedagogical challenges in terms of teaching mthods and assessment strategies and tools (Flores & Gago, 2020). According to Cutri, Mena & Whiting (2020), assessment while teaching online was of a challenge and the faculty desired to know how to do formative and summative assessment of student learning while teaching online.

Regading innovations in teacher education in the time of the Covid-19 pandemic, Scull, Phillips, Sharma and Garnier (2020) mentioned the conversion from face to face to online courses, including synchronous and asynchronous learning opportunities. Accessibility and flexibility in the way the content was designed and delivered through out the training course

was very necessary to ensure success of teacher education.

SEAMEO RETRAC began its operations in October, 1996, under the functions and responsibilities of an agreement between the Government of Vietnam and the Southeast Asian Ministers of Education Organization (SEAMEO), with the mission of assisting SEAMEO Member Countries in identifying and addressing issues of education. Among the core activities implemented by SEAMEO RETRAC is the in-service teacher training. In Vietnam , SEAMEO RETRAC has been assigned by the Ministry of Education and Training to conduct in-service teacher training under the National Foreign Languages Project for serveral provinces in the south of Vietnam.

The National Foreign Languages Project is the first large scale effort by the Vietnamese government to improve the instruction of and through foreign languages primarily English within Educational system. English language proficiency and English language teaching methodology are two focused areas that we offered in in-service teacher training in 2020 and 2021 during the COVID-19 pandemic.

A survey on the in-service teachers participating in the training programs was conducted. We got a return rate of over 80 percent of teachers who answered our on-line questionnaires and we also interviewed about 20 percents of teachers in our training courses.

Challenges of in-service teacher training in the COVID -19 pandemic

The challenges caused by the COVID-19 pandemic particularly the unprecedented and

forced shift from the face to face to the online teaching of the in-service teacher training programs during the pandemic are very clear. Findings from a survey on the teachers taking part in the training in 2020 and 2021 at SEAMEO RETRAC and observations on the implementation of on-line training during these years indicated quite a lot of challenges from the new pedagogy and the training mode in these two years. The first challege is that the teachers' readiness including their skills in using ICT for teaching and learning is still very limited. Many teachers were not trained to use digital devices and digital technology for teaching and learning. Moreover, the frequent crashes of the LMS platform and poor internet connection at some provinces negatively affected their learning experience. The training methods and training activities were not rich due to the constraints of online mode and this led to the boring online classrooms. Trainers complained that they could not manage their class well and did not really know if the learners were following the online class sessions. Some localities had to delay the training in complying with COVID-19 pandemic prevention measures. In addition, professional development was not really of the top interest of teachers due to the many other priorities including safety, health and food. It was almost impossible for teachers who are COVID-19 infected or who are living in the quarantine areas to take part in the training despite the fact that it was offered online.

Innovations in in-service teacher training during the crisis

During the COVID-19 pandemic, SEAMEO RETRAC used mainly the Zoom platform and Moddle on our learning management system (LMS) for in-service teacher training for teachers from many provinces in the South of Vietnam. We conducted the training directly on Zoom platform and we used this platform to give lectures, to have the learners do different classroom activities in group as well as individually with the support of Zoom, LMS and other useful applications such as Padlet, Quizzes, Kahoot, etc. Both synchronous and asynchronus on-line teaching approaches were used for in-service teacher training.

Though face to face teaching can easily apply physical intereaction in the classroom, on-line teaching at SEAMEO RETRAC could also help teachers learn with high motivation, using good digital techniques for classroom participation and classroom management, even classroom assessment. To achieve this, the use of different pedagogy, including on-line teaching techniques was employed. Giving lectures was not the main method of delivering the lessons, but many other methods of teaching were integrated in the class meeting sessions and in the self-study time as well.

Quite a lot of classroom activities could be done on Zoom platform during our class meeting sessions. We could help the learners learn new knowledge, practice using the new knowledge and apply the knowledge through micro-teaching on the zoom platform.

In order to prepare in-service teachers for their success in the teacher training programs, orientation workshops and tutoring activities are very crutial. A group of tutors and technical supporters had been established and they could asisst the learners at any time during the training time.

In addtion to the formal training courses, a series of webinars, virtual symposiums, on-line ICT training workshops were offered for the in-service teachers to help them develop their profession in different ways during the pandemic.

Moreover, to achieve success in in-service teacher training, self-study sofwares have been created and the learners could learn and assess their progress at all time and at their own pace during their available time. Formative assessment of online learning has proved to be a key to success in these in-service teacher training programs.

Investment in the teaching and learning facilities especially the digital devices and professional development for trainers and academic managers regarding the update of digital teaching methods and assessment tools were considered to be among innovative solutions for many challenges facing to the in-service teacher training during the crisis.

Lessons learned from the application of innovative platforms for teacher training in the COVID-19 Pandemic

Among the important lessons learned from in-service teacher training during the COVID-19 pandemic at SEAMEO RETRAC is the preparation for in-service teachers (learners) of the readiness to take the training with new training modality. Though digital technology had been used by some teachers at schools before the pandemic, many in-service teachers were not ready for the online training which required quite a lot of digital skills. Many teachers who were working in provinces had not had opportunity to use as

much technology in the classroom before the pandemic. Therefore, to ensure the effectiveness of the on-line teacher training, prior orientation workshops, ICT training workshops and technical supports were very necessary.

Another lesson which can be counted is the appropriate teaching methods which can create high motivation and active participations of the learners. Training activites have to be various and attractive to the learners since on-line learning can easily demotivate the learners due to the lack of interactions, physical activitis and natural learning environment. Both synchronous and asynchronous should be used in the training since each approach has its own benefits on the in-serivce teachers. Providing sufficient training lessons in different forms and a variety of training materials in the LMS platform has proved to be very effective and useful for the learners.

Investment in the training facility especially the devices and conditions for online, web-based training and internet connection for both training institutions and the learners is very necessary to ensure the effectiveness and succes of the training programs. Innitiatives on the use of digital technology and innovative platforms should be disserminated and widely applied in the training.

Though learners can learn at their own time and pace in the asynchronous sessions through the designed LMS, in-service teacher training programs should be scheduled in the months when learners can pay their high attention to the training. During the two years of the COVID-19 pandemic, there was time when safety, health, and food could be of the leanrers' top priority. Therefore, in-service teacher training programs

had to be delayed until the pandemic became less severe.

Policy recommendation

Through my work experience and my close study on in-service teacher training during the COVID-19 pandemic, beside the lessons learned described above, the policy recommendation to delop more effective teacher training would be the continuous use of digital technology for in-service teacher training programs. Innovative educational platforms and digital devices / applications being used for online training in the COVID-19 pandemic need to be further developed and used in the post COVID-19 pandemic in the hybrid modality. In-service teachers should be given more opportunities to use digital technology in their own teaching and especially in their profesional development even when they can go back to face to face training after the pandemic. To support this is certainly to help enhance life long learning spirits among the in-service teachers in the post COVID -19 pandemic and in the future.

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SEAMOLEC Journey on Providing Professional Development for Teachers in ICT Integration into Teaching and Learning

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ABSTRACT

In 2022, SEAMEO SEAMOLEC proudly acknowledged its 25 years of providing open and distance learning (ODL) services to Southeast Asian countries. Today, the field of ODL is gaining great popularity all over the world. Especially the last two years, 2020-2021, has been a tough time for everyone as the Covid 19 pandemic force the government to close the schools and push global transformation on implementation of distance learning in formal education. Major national efforts to use technology to support distance and online learning are evolving rapidly. Under these circumstances, the SEAMEO Regional Open Learning Center (SEAMOLEC) is looking for the ability to provide alternative solutions to help partners address these challenges. The experience of SEAMOLEC in delivering their teacher training program in the online learning mode since 2017, has been the a valuable experiences to assist teachers in this difficult time. However, it is a remarkable year that SEAMOLEC aims to improve the quality of ODL through national and regional programs.

Keywords: open and distance learning, Southeast Asian countries, support teachers and educators, variety of programs, ICT skills

Introduction

SEAMEO Regional Open Learning Centre (SEAMOLEC) is one of the 26 Centres under the auspices of Southeast Asian Ministers of Education Organization (SEAMEO) focusing in the field of Open and Distance Learning (ODL). Owing to various programs that become its core tasks, like; trainings, consultancies, research and development, and information dissemination, SEAMOLEC is assisting the SEAMEO Member Countries to find alternative solution to enhance the quality of its people through Open and Distance Learning (ODL).
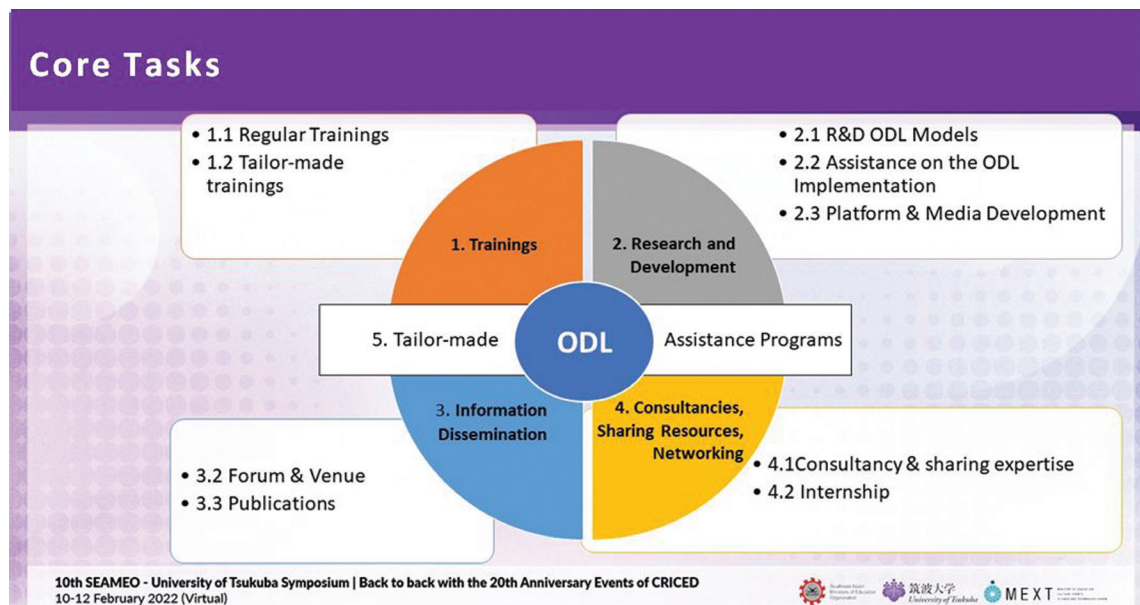
Figure 1. SEAMEO SEAMOLEC Core Tasks

Online Learning Platforms

In order to support teachers professional development, especially to equip them with required competencies and skills to deliver their learning materials by utilizing distance learning supported by technology. Online learning platforms will be an imitation of the real classroom, where interactions between teachers and students as well as among students happened virtually. SEAMOLEC is providing several online platforms that have different characteristics based on the teachers and students experiences. In this platform, four platforms are being introduced: SIAJAR LMS, SEAMOLEC MOOC, and Moodle-based E-learning. Additionally, there are two SEAMOLEC content repositories also being shared here.

1) SIAJAR LMS

SIAJAR LMS is the SEAMOLEC owned Learning Management System (LMS), that was developed to integrate the advantages of Social Learning Network (SLN) with the Learning Management System approach. This system was developed due to the needs of Indonesian education system regarding the online learning platform in Bahasa Indonesia. Instead of utilizing course-based structures, SIAJAR LMS is utilizing class-based structures that is commonly use in Edmodo or Google Classrooms.

Systemically SIAJAR is connected and integrated with Learning Resources so that teachers can manage learning safely and quickly. SIAJAR is designed to provide easy display as well as control in the implementation of digital classes. As a Learning Management System (LMS), SIAJAR provides complete learning from designing, implementing learning, to assessment.

Currently this platform is being used nationally for online learning in Indonesia non-formal education institutions. This platform is also as an official learning management system for the distance learning programs conducted by Indonesian Schools Abroad (Sekolah Indonesia
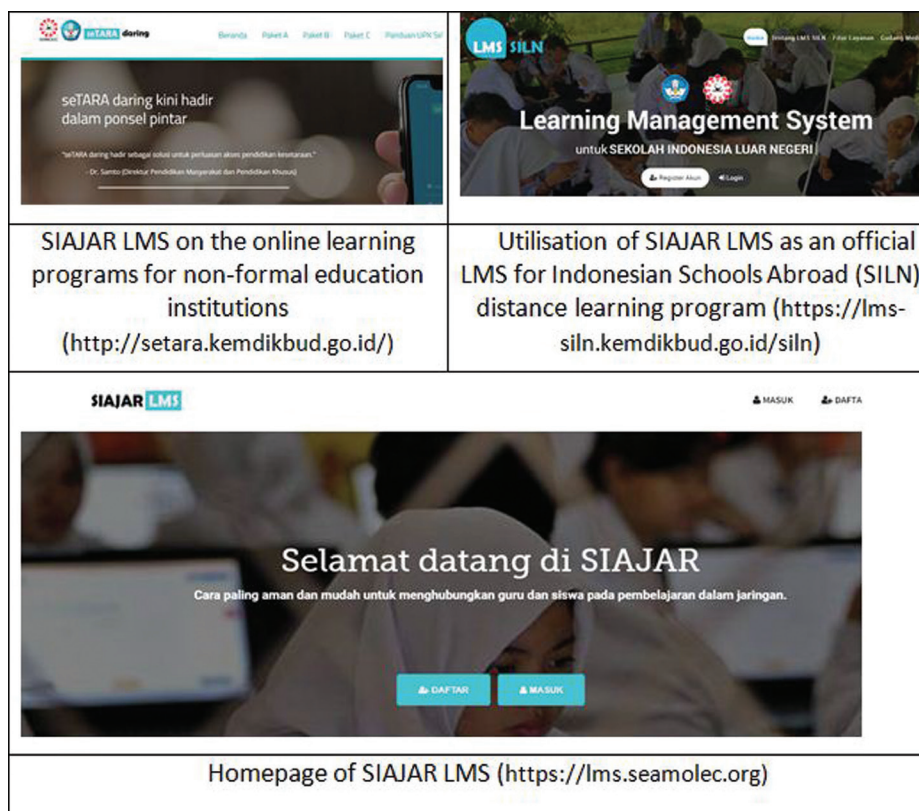
Figure 2. SIAJAR LMS

Luar Negeri/SILN). In 2017-2019, West Java distance learning programs for senior and vocational high schools under the coordination of West Java Education Offices is also utilizing this platform. However in general, SEAMOLEC is open this platform for public, that can be accessed on https://lms.seamolec.org/siajar-lms.php.

2) SEAMOLEC MOOC and OER Repository

Massive Open Online Courses (MOOC) is provided through platforms featuring functionalities and structure similar to a Learning Management System (LMS). Thus, the courses are broken down into modules, containing various types of content, such as; video lectures, text documents, and quizzes. MOOC has three concerns that are Open Access, Scalability and Quality. Open Access

means anyone can participate in online courses which are free. Scalability means MOOC is designed to accommodate students/ participants in unlimited amounts. SEAMOLEC as the SEAMEO Centre for Open and Distance Learning (ODL) in Southeast Asia region continued its expertise to initiate and develop innovation program on the ICT utilization forteaching and learning through Flexible Learning & Innovative Programs (FLIP).

FLIP is the term used for SEAMOLEC's MOOC (Massive Open Online Course) which was launched on 28April 2016. In early 2017 SEAMOLEC decided to change the term FLIP into SEAMOLEC MOOC. With technology rapidly evolving, policy-makers and higher education institutions need better assess ways in which MOOCs and OER could be effectively leveraged to improve access, enhance quality and

potentially lower the cost of higher education. There are two characteristics of the online course provided by SEAMOLEC MOOC; (1) MOOC (online courses with accompaniment), and (2) OER (Open Educational Resources), the online courses without accompaniment (as the repository). SEAMOLEC MOOC has become the platform used by SEAMOLEC to provide various course materials for its online training. All online learning activities are conducted in this platform, such as course overview, discussion forums, assignments, assessments, etc.

3) Moodle-based eLearning

Courses that require intensive assistance from the instructors are recommended to be delivered through SEAMOLEC's Moodle-based open source LMS. It can be accessed through elearning.seamolec.org which is used for various levels and institutions, especially for Higher Education Institutions. Beside that, SEAMOLEC is also preparing a dedicated eLearning for Common ASEAN Tourism Curriculum (CATC) -based online learning courses which is used for the dissemination and implementation of the CATC to prepare qualified tourism professionals.

Online Trainings for Teachers

Several typical learning constraints include distance, isolated domicile, time consuming transportation, mismatch between school hour and working hour. These conditions have

SEAMOLEC MOOC
(http://mooc.seamolec.org/)

OER Repository
(https://sumberbelajar.seamolec.org/)

Figure 3. SEAMOLEC MOOC and OER

General Instructors-lead Courses on
(https://elearning.seamolec.org/)

CATC-based online courses on
(https://catc.elearning.seamolec.org/)

Figure 4. Moodle-based eLearning

motivated people to get access to education without going to campus, school building, training centers, or other educational centers. Many people with the constraints cannot go to regular course or training.

However, they have the opportunity to have education through open and distance learning (ODL) mode. Through this mode people learn by themselves actively with minimal assistance from other people. They learn from printed self-instructional materials and ICT-based, such as digital book, web-based, audio and video-based, and many other teaching and learning resources. ODL delivery system can be described as falling somewhere along two continua. One continuum has as pole all students and their tutor at the same place, and as the other pole all students and their tutor in different places. The second continuum has as one pole all students and their tutor interacting in real time, that is, at the same point in time and as the other pole all students and their tutor interacting at different times.

SEAMOLEC with 25 years of experiences in developing of ODL since 1997 in Southeast Asian is starting to conduct the online training in the region with the platform of SEAMOLEC MOOC (Massive Open Online Course). In national program (Indonesia), the online training has conducted for several batches and training programs for more than 10.000 teachers as participants.

There are various SEAMOLEC training programs since 2017-2021 and in general it could be grouped into six: 1) Development of video-based learning media, 2) 2D Visualisation, 3) 3D learning media, 4) Interactive learning media, 5) Management of Digital/Virtual Class, 6) ICT Specialised courses as shown in Figure 5 below. Within 5 years implementations, there are several milestones on the implementation of online trainings for teachers. At the beginning when the course was firstly open, 17 courses were delivered in 2017 and successfully attract more than 15,000 teachers. However due to
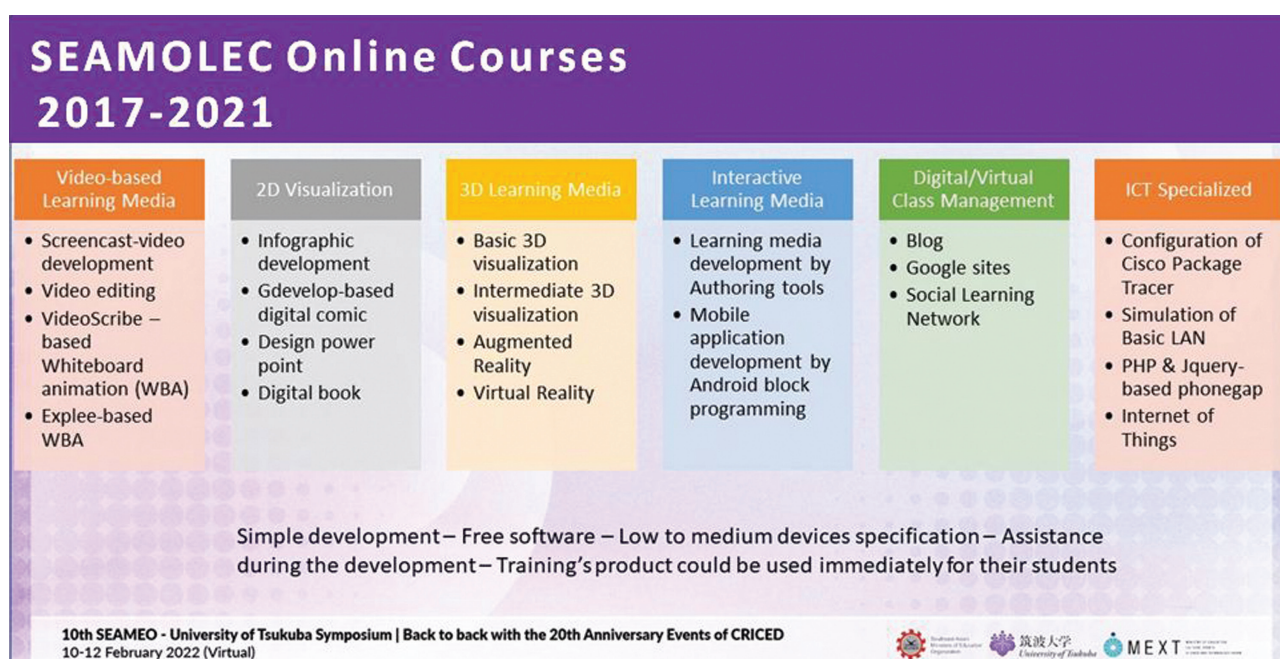

Figure 5. SEAMOLEC Online Courses 2017-2021

the changes of the internal policy regarding the resources, the numbers of courses is reduced in the following year. Due to the pandemic situation, in 2021, the teachers enthusiasm to join online learning was getting higher again. Almost 10,000 teachers were participated in 8 courses. Most participants (more than 5,000 participants) were joining an online course to adapt new normal situation that aims to equip teachers with suitable competencies in planning the online class, developing simple media in the form of e-modules and video screencast, doing engaging interaction with students, as well as presenting those learning media in certain online learning platform.

SEAMOLEC online training is conducted by utilizing various integrated platforms. First the participants are required to register themselves on the SEAMOLEC E-Training registration system. By registering, every participant will get unique number as their ID that could be used frequently in this system. After that, the participants will get access to the SEAMOLEC MOOC platform, where they can learn individually based on their self-pace. Synchronous meetings are also scheduled several times in order to get further assistance from the instructors. Since most of the SEAMOLEC trainings are required the submissions of trainings products such as: learning media or teaching plan in order to be eligible to get completion certificate, the instructors also available for any questions or feedbacks during training.

Models on Online Teachers Training (2021-2022)

Digital Comic for Engaging Online Learning

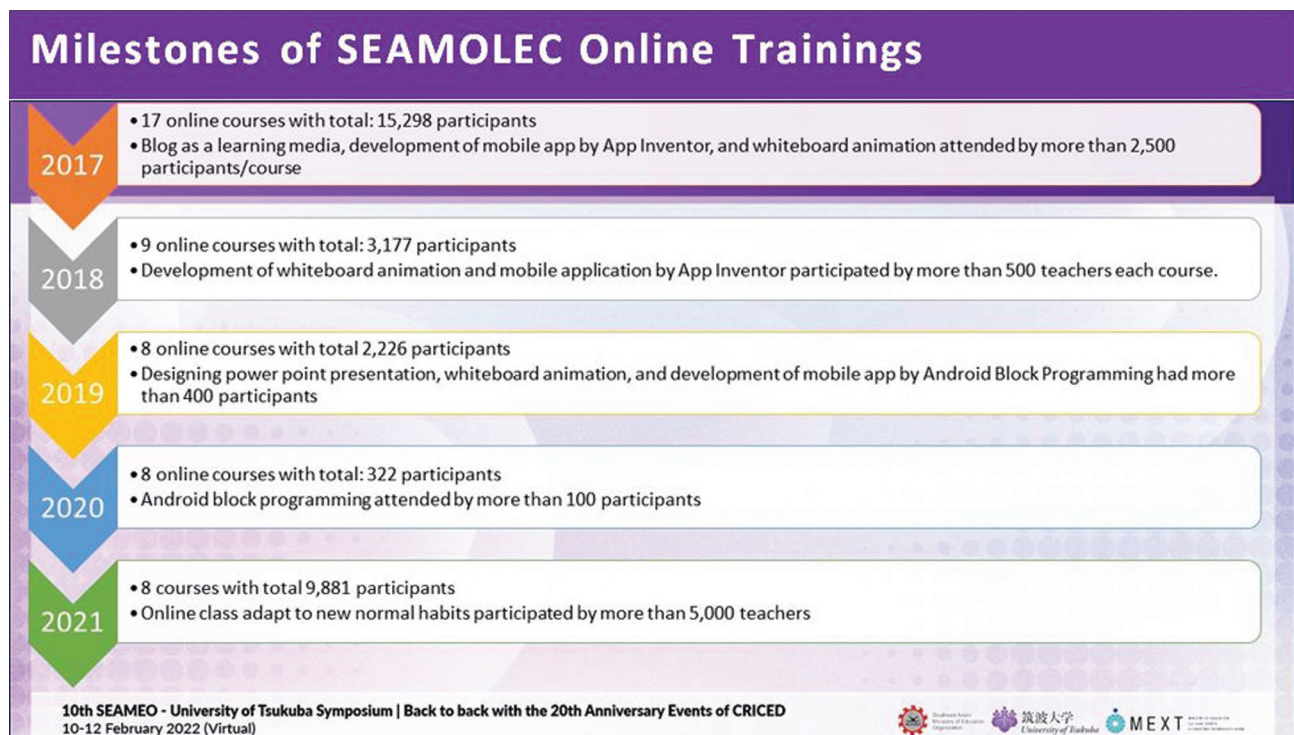The Covid-19 pandemic has forced schools from 190 countries around the world to close

Figure 6. Milestones of SEAMOLEC Online Trainings

schools and stop all activities in schools (World Bank, 2020). As a result, more than 1.7 billion students are forced to study from home. In a very short time, educators must find a way to ensure students continue to learn. The majority of educators choose solutions to migrate face-to-face learning to online modes. Online learning, which actually requires careful preparation, has turned into Emergency Remote Teaching (ERT) with all its limitations. Hodges, et al. (2020) explain that ERT is a temporary migration from face-to-face learning activities to alternative modes due to crisis conditions. This alternative mode is distance learning, which later returns to face-to-face format after a crisis or emergency subsides. The role of the teacher in managing learning is the key to ensuring students learn as they should. In this case, it can be seen the urgency to equip teachers not only with technological knowledge to operate certain tools. But what is more urgent is the need for teacher pedagogical knowledge in exploring the potential of technological tools that are not only used as learning resources but can also be used to actively involve students in collaborative activities with their peers. In addition, teachers also need to be equipped with knowledge to orchestrate technological tools in a learning design. Well-designed online learning will have an impact on increasing student activity, creativity, interest and motivation, which in turn will also result in better student learning outcomes.

SEAMOLEC in collaboration with the Universitas Pendidikan Indonesia (UPI) and Institut Teknologi Bandung (ITB) planning was conducting Online Training on Teacher Competency Development in Designing Student Learning Engagement in Special Conditions. Resource persons involved in the development
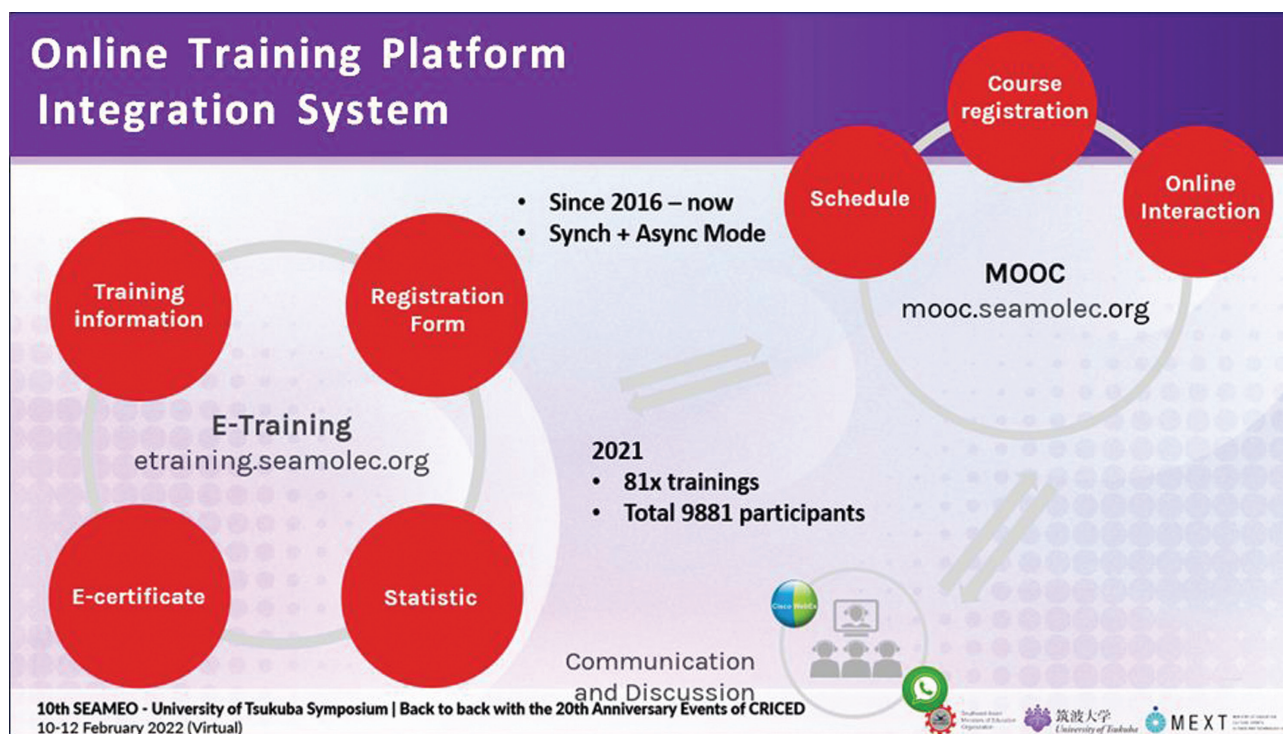

Figure 7. Platform on Online Trainings

of this model are Dr. Finita Dewi, S.S., M.A. and Tia Citra Bayuni, M.Pd from Universitas Pendidikan Indonesia, Dr. Gumawang Jati, M.A. – Institut Teknologi Bandung. During the planning, the development of this teachers training refers to several aspects as described below:

- Bite-size learning
  The material will be designed in such a way that takes into account the participants' cognitive load. The instructional videos are delivered in the form of a micro video lecture with a duration of not more than 5 minutes. Activities are designed in stages from simple to more complex levels.
- Engaging
  Participants do not become passive learners who only receive information conveyed by the instructor, but participants will be actively involved both in exploring sources of information through online research, discussing with lecturers and colleagues in small groups, and exploring relevant technological tools for learning.
- Collaborative
  The training materials will facilitate collaboration in small groups and maximize interaction between participants in completing projects.
- Flexible
  In completing this training project, participants will have the freedom to choose the format or output model that will be produced by them, referring to the signs and corridors that have been provided by the instructor.
- Assessment for Learning
  In the process of working on a training project, an assessment rubric for both the process and the product has been given at the beginning of the training so that participants know which aspects must be considered and will be used as assessment material. In addition, participants will receive feedback on an ongoing basis.

This online training is expected to be a solution in preparing teachers to present distance learning in accordance with the characteristics of students who are Alpha generation who are very familiar with the use of technology and gadgets. The internet is the most urgent need for the alpha generation, so many of the students feel bored if they take part in learning which is only in the form of assignments written by the teacher via short messages, the involvement of students is low. The development of online training is expected to increase the ability of teachers to create a learning process that is suitable and easily accepted by the alpha generation so that it will have a significant impact on the activeness of students who experience learning in times of special conditions like today.

Gamification Course

Since the COVID-19 pandemic hit all over the world, almost all activities have migrated to online, including learning. However, many obstacles were encountered including the learning approach. It takes a variety of learning approaches, one of which is gamification. This training aims to introduce the gamification method to junior high/high school teachers as an innovative learning method that can increase student motivation and involvement in learning activities both online and offline. After completing this training, training participants are expected to be able to: a) explain gamification

Avatars of the Digital Comic Participants

Digital Comic created by participants from Thailand

Figure 8. Digital Comic for Engaging Online Learning Course

Interface of Gamification Course
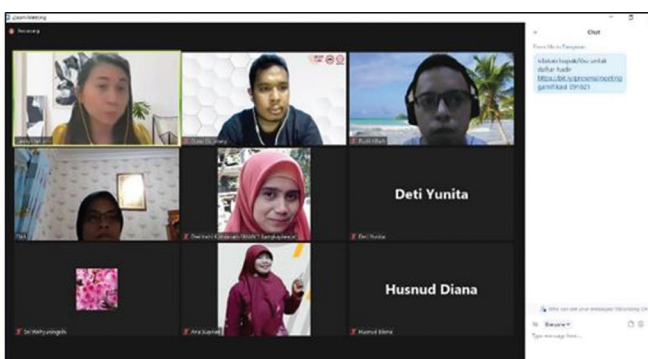
Synchronous Discussion

Figure 9. Gamification course for science teachers

and its role in learning management and b) design gamification classes according to the subjects taught. The duration of the training that has been carried out is 80 hours. Starting on September 1, 2021 and ending on October 20, 2021.

The training strategy used is as follows: This training utilizes the gamification learning method with scenarios inspired by the game "Monopoly Tycoon". Therefore, in this training, the trainees are not only invited to learn the concept of gamification and its implementation in learning, but also to play in "Monopoly Tycoon". The trainees will be invited to hunt and invest Monopoly Tycoon dollars ($) in accordance with the Book of Rules that has been prepared by the training instructor. At the end

of the training, the trainees will be invited to reflect on the gamification strategy and also to design a Book of Rules by the trainees that will be used in learning. This training is limited to 50 participants and participants who can complete as many as 14 participants.

Conclusions

This paper is shared the SEAMOLEC efforts to support the distance learning implementation in Southeast Asia. Various online learning platforms with different purposes are provided for public that are could be used to familiarize teachers with the management of virtual learning. Annually, since 2017 until now, SEAMOLEC is also delivering various courses on the utilization of ICT tools. Thousands teachers are annually

participated and then their training products submission is the evidence of those teachers digital skills. In 2021, SEAMOLEC is also focusing on the engaging online learning by providing digital comics and gamification courses. Lesson learn from last year development will be part of further improvement in this SEAMOLEC teacher's trainings programs.

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Ensuring Continuity of Learning for Learners with Disabilities

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ABSTRACT

The devastating impact of COVID-19 has affected the education sector as schools are no longer operating as usual. Most of the countries have experienced numerous school closures and reopening since 2020. However, as the outbreak is under control, some countries have implemented hybrid learning and face-to-face classes that still need to adhere to strict health protocol, social distancing and wearing masks. During the back-to-school phase, the education system needs to accelerate learning recovery in order to mitigate the learning loss. If it is not addressed, it will undoubtedly lead to learning poverty. As recommended by World Bank, UNESCO, and UNICEF in a report on Mission: Recovering Education 2021, efforts to ensure the continuity of learning should be focusing on bringing all children back to schools, recovering learning losses, as well as preparing and supporting teachers. Therefore, this paper aims to describe SEAMEO SEN's efforts to equip in-service and pre-service teachers with adequate teaching skills to ensure the continuity of learning for learners with disabilities (LWD).

Keywords: continuity of learning, Disability-Inclusive Teaching in Emergency (DTeEm), learners with disabilities, learning loss, learning recovery

Introduction

COVID-19 has caused unprecedented disruptions to the education sector as schools worldwide are closed. Since the pandemic started in 2020, schools in some countries have been closed for two consecutive years to curb the coronavirus disease outbreak among learners. In the Southeast Asia region, most of the countries had to undergo school closures a few times. For instance, countries like Malaysia, Singapore and Lao PDR experienced school closures once in 2020 and 2021, whereas schools in Thailand faced school closures more than one time during the two years of the pandemic.

Table 1. School Closures in Southeast Asia

Year	1-2 times school closures	3-4 times school closures
2020	Malaysia	-
	Thailand	
	Singapore	
	Lao PDR	
	Indonesia	
	Vietnam	
2021	Malaysia	Thailand
	Lao PDR	
	Vietnam	

Impact of School Closures

Two years into the COVID-19 pandemic, the education system has changed dramatically and has affected learners' level of performance and participation due to the limited face-to-face interaction with the teachers during the school closures. Unfortunately, learners with disabilities face more significant challenges following the change to distance/online learning. The COVID-19 pandemic exposed the shortcomings, fragilities, risks and inequalities in the education of learners with disabilities within and across countries (UNESCO, 2021). It clearly shows that the impacts of school closures on learners with disabilities are higher than those without disabilities. UNESCO Asia and Pacific Regional Bureau for Education (2021) also found that the prolonged school closures have aggravated the learning crisis, raised pre-existing inequalities, and inhibited equitable and inclusive education achievement in achieving the Sustainable Development Goal (SDG) 4.

Learners with disabilities are likely to face more significant barriers in accessing distance learning and face an increased risk of dropping out of education during disruptions to learning (United Nations, 2020). The absence of appropriate assistive technology, inadequately trained teachers, limited access to the internet, and inaccessible learning materials and support system has increased their exclusion from education.

The prolonged school closures have hindered their development of social skills, especially for learners who struggle with social and communication problems like learners with autism and learning disabilities. The limited social contact also has affected them psychologically, as learners with disabilities are usually sustained and stimulated by interaction with peers (United Nations, 2020). Consequently, huge numbers of learners with disabilities are not achieving the expected level of learning and performance.

School Reopening Mitigation Efforts

As the spread of COVID-19 has flattened, most schools are gradually reopened and are back to a physical class, conforming to strict health protocol. The back-to-school transition takes an all-out effort to ensure that learners with disabilities are prepared to go back to school. Due to the prolonged school closures impacts, the education system needs to accelerate learning recovery to mitigate the learning loss.

A prompt action by all parties, namely teachers, administrators, and parents, is required to address the learning loss to avoid learning poverty among learners with disabilities. Thus, the need to have a renewed preparation to respond to crises while attending to learners with disabilities' academic needs is highly emphasized. A report on Mission: Recovering Education 2021 by World Bank, UNESCO, and

UNICEF, recommends three essential strategies that need to be focused on during the post-pandemic phase, which are, i.) bringing all children back to schools, ii.) recovering learning losses, and iii.) preparing and supporting teachers during the transition of the back-to-school phase.

Remediation effort by educators is highly needed to support the learners in catching up on lost learning through a variety of means, including additional teaching time, focused content, and specific pedagogy (UNESCO, 2021). Therefore, educators of learners with disabilities must be equipped with training and support to provide accessible and individualized learning plans that include blended approaches combining lower tech or no tech solutions, captioning and sign-language options, and including integrating remedial classes (UNESCO, 2020).

Continuity of Learning for Learners with Disabilities

As the COVID-19 pandemic has increased the risk of further marginalization for vulnerable groups, learners with disabilities are more likely to experience exclusion from education in comparison to learners without disabilities. Holistic planning is a much-needed effort in ensuring the learners are still receiving a quality education despite unprecedented times. The plan should comprise the transition from a face-to-face class to an online class, then school reopening after prolonged school closures and lastly, the recovery phase during the back-to-school.

A report by World Bank (2020) titled COVID-19 Pandemic: Shocks to Education and Policy Responses mentioned there are three (3) response phases, i.) The Relief Phase, ii.) The Recovery Phase and iii.) The Resilience Phase. Firstly, the Relief Phase outlines the immediate actions needed to ensure inclusive response while learners are away from their classroom environments. Then, the Recovery Phase highlights the medium-term strategy-steps that must be taken to ensure that learners with disabilities are not left behind when schools begin to reopen. Lastly, the Resilience Phase includes long-term actions that should be implemented to increasingly make progress to a more inclusive, equitable environment to mitigate the learning loss (World Bank 2020). These phases are necessary to bring the learners with disabilities to achieve the expected level of learning.

In response to the three phases, SEAMEO SEN, as collaborated with UNESCO Bangkok and SEAMEO Secretariat, has developed an online learning module titled Disability-Inclusive Teaching in Emergency (DTeEm) Course for teachers entitled *Responding to Educational Needs of Learners with Disabilities in Emergencies*. This module was funded by the Global Partnership for Education (GPE) and designed to escalate teachers' capacity in the four (4) following areas; Stress Management and Psychosocial Support, Utilization of Different Assistive Technologies, Developing Emergency Response Plans, and Continuity of Learning. This online learning module has been adopted and piloted in four countries in Asia: Bhutan, Cambodia, Lao PDR, and Timor-Leste and is available in six languages, English, Laotian, Indonesian, Tetum, Cambodian, and Dzongkha.

Among the four areas in this online learning module, one module highlights the continuity of learning for learners with disabilities. This module consists of 4 chapters; Chapter 1: Learning Continuity for Learners with Disabilities, Chapter 2: Transitioning from Face-to-Face Instruction to Remote Instruction, Chapter 3: Transitioning from Home-Based Instruction to School-Based Instruction, and Chapter 4: Ready to Teach and Learn. This 4-chapters-module covers every aspect of ensuring the educational services are continuously delivered while providing an inclusive learning space for learners with disabilities in different modalities. Furthermore, this module also offers guidance for educators in bringing back the learners to school with considerations of their well-being, safety, and readiness to attend the face-to-face learning, also the strategies to access the learning gap and learning loss.

Aside from that, this online learning module also provided three other areas: Module 1 on Stress Management and Psychosocial Support, consisting of 4 chapters, will enlighten educators on effective interventions on stress management and strategies to provide psychosocial support to educators and learners with disabilities. From this module, educators are able to tap others' potentials to assist families at home, school, and community. This module will also elaborate on the benefits of these interventions for the well-being of learners with disabilities.

Next, Module 2, consisting of 3 chapters, is about Utilizing Different Assistive Technologies. In this module, educators will learn about assistive technology devices' different functions and benefits to learners with disabilities. Educators will also be able to determine the appropriate assistive technologies for the learners and ways to modify and adapt those tools to facilitate the learning process of learners with disabilities.

Lastly, Module 3 on Developing an Emergency Response Plan, which consists of 3 chapters, will equip educators with knowledge and skills related to disaster risk reduction at school. This module will explain ways to mitigate the impacts on learners with disabilities following inclusive principles in emergency planning and response. This module also shares the comprehensive emergency response, emergency standard operating procedures (SOP), and safety rules that will help accommodate learners with disabilities.

The unprecedented events like the COVID-19 pandemic have caused learners with disabilities to experience difficulties to go through a practical learning session and regress them from achieving the expected level of achievement. Thus, this module will equip the educators of learners with disabilities with adequate skills in planning, preparing and offering an effective educational service during the unprecedented events and assuring learners are back on track during the post-events. This effort is moving towards achieving the primary aim of providing learners with disabilities with the required educational needs.

Overall, this online learning module is expected to guide special education educators to deliver their educational services despite unprecedented situations like pandemics and act as an accessible source of information in developing capacities of educators to support learners with disabilities.

Capacity Building for Special Education Teachers

As a regional centre for special educational needs, SEAMEO SEN is mandated to ensure special education teachers in the Southeast Asia region are equipped with skills and knowledge that will help them deliver high-quality educational services to learners with disabilities. Currently, SEAMEO SEN has started to promote the DTeEm Course to the pre-service and in-service teachers in SEAMEO member countries to prepare and support teachers, to ensure the continuity of learning for learners with disabilities in responding to the pandemic.

Additionally, SEAMEO SEN also organized an online training titled Post Pandemic Continuity of Learning for Learners with Disabilities, in which the best practices in delivering educational services during and after the pandemic were shared. This training aligns with one of the topics discussed in the online learning course, which is Module 4: Continuity of Learning. This training aimed to develop special education teachers' capacity in ensuring learners with disabilities are able to continue their learning process during the school closures and after the reopening of the schools. Furthermore, this training focused on creating relevant learning materials in accessible formats for the teachers of learners with disabilities at the primary level. As a result, teachers will be equipped with knowledge on ways to elevate the quality of teaching during the school closures and facilitate the transition of returning to school.

In 2022, SEAMEO SEN has levelled up its effort in promoting best practices for special education teachers by providing training that includes various areas and themes that move towards developing an inclusive environment for learners with disabilities. These trainings are specified for special education teachers, but it is also expected to benefit education personnel, mainstream teachers, parents, caregivers, and the community who work with persons with disabilities. A collaborative effort to apprehend inclusiveness by each party is necessary for supporting learners with disabilities to be independent and achieve success like others.

Viewpoint from Educators

An evaluation survey was conducted to identify a total of 24 participants' feedback on the online module training, DTEeM. At the end of the training, each participant is required to record a testimonial video to express his/her feedback on the online learning module. The participants who are the in-service teachers gave favorable feedback on DTeEm online course.

Great sharing session. Now I have a better understanding on how to use assistive technology that I have to teach my students and able to utilize resources around me to be used in my teaching. (Participant 1, Malaysia)

It is an eye opener sharing about the effects of post pandemic towards students with disabilities. (Participant 2, Philippines)

Thank you SEAMEO SEN for organizing this course. I hope this online module can be translated into other languages so that it can be used to help more students with disabilities in other countries. (Participant 3, Indonesia)

All in all, participants who are educators of Special Educational Needs from SEAMEO

member countries expressed that the module has greatly expanded their understanding and provided great insight into how it can be used to achieve the learning outcomes. Moreover, the participants have also viewed the modules as very informative as it presented creative approach to teaching learners particularly during and after the pandemic. In addition to its well-crafted content, the teachers also expressed that they learnt the various techniques and relevant learning materials which are incorporates in an accessible format.

A total of 118 pre-service teachers who are still undergoing teacher-education programme participated in the Post Pandemic Continuity of Learning for Learners with Disabilities training online. All participants gave positive feedback on the training as they have gained new knowledge on continuity of learning during and post-pandemic for learners with disabilities. This training is beneficial for the pre-service teachers as it will help them prepare their professional development before integrating teacher profession. Ensuring that teachers possessed the skills and competency that lead learners to participate accordingly and comprehensively while learning, are the valuable and fundamental content provided by speakers of this 2-hour-training session.

The sharing session is very good. The training is useful and benefit me greatly as a special education teacher-to-be. The speakers share a lot of knowledge that are important and can help me in the future. (Participant 1, Malaysia)

I've learned new knowledge today on how to teach disabilities students during pandemic.
(Participant 2, Malaysia)

I love how the speakers explain. Thank you for sharing how to prepare students back to school after the school closures.
(Participant 3, Malaysia)

Generally, the DTEeM module and the online training helped prepare the in-service and pre-service teachers to address learning loss by adapting relevant and quality pedagogy. Furthermore, the training session also served the educators of learners with disabilities with guidance on incorporating technologies such as providing accessible learning materials for learners with disabilities. This effort is to ensure the learning session continues despite unexpected situations.

Conclusions

In a nutshell, going back to school is very challenging for educators and learners. Hence, educators' readiness to adapt and prepare the continuity of learning after a long period of school closure is essential as they need to assure learners with disabilities can catch up and continue the learning session.

An adequate and continuous capacity building for educators is necessary for the transition from physical learning to distance learning, school reopening, and learning recovery during the back-to-school phase. The school closures due to the pandemic have shown that educators need to fit in learners' needs and concur with current circumstances. Hence, it is important to revisit teachers' capacity building with current needs aspects like online pedagogies, special assessments to identify the learning gap, and necessary remediation to mitigate the learning loss.

Apart from that, an accessible learning material such as the DTEeM module can also be used as guidance for educators in ensuring the learning session continues despite the critical times and offer appropriate approaches on recovering the learning loss for learners with disabilities.

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Assessing the Curriculum Implementation Effectiveness at General and Technical High Schools in Cambodia

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ABSTRACT

Recently the curriculum developers and policy makers have expressed alarm about the implementation effectiveness of technical education curriculum at the secondary education level in Cambodia. While most agree that the imbalance between theories and practices deserves attention for some supporting subjects of each trade contextualizing the labor market need. Skills mismatches are paid high attention for technical education development. This cross-sectional study design employs the importance-performance analysis (IPA) approach for 213 participants as year two students to assess the curriculum implementation effectiveness. The paper identifies some subjects that work well, some that need immediate actions, and some that require improvement or correction among five trades, namely electronics, electricity, animal husbandry, agronomy, and accounting and management. This assessment of curriculum implementation effectiveness points out the limitations of curriculum contents and suggests the need for a holistic approach in curriculum development participated by industry representatives, technical education teachers, curriculum experts, and policy makers.

Keywords: curriculum, general and technical high schools, teacher, and technical education

Introduction

Curriculum is a central guide to support teachers and students in teaching and learning successfully. A curriculum is an instructional sequence of contents and direction ensuring that teaching and learning take place productively in schools (Walker, 2003). The curriculum needs to be authentic in nature, capture theories and practices, and cultivate knowledge, skills and attitude. Therefore, the curriculum is crucial for education and training.

Technical and vocational education and training (TVET) plays such an integral part in accelerating economic growth that some advanced countries prioritize it as one of the

forerunners such as Germany, Japan, South Korea, UK, etc. Likewise, the Royal Government of Cambodia (RGC) also put emphasis on TVET development by setting out at least one general and technical high school (GTHS) in each province for a short-term vision and at least one general and technical high school (GTHS) in each district for a long-term vision in order to transition its economic status to an upper middle-income country in 2030 and to a high-income country in 2050. To achieve this ambition, TVET needs to have quality and responsiveness. To be responsive, the curriculum needs to embrace theories and practices capturing work reality. However, there is a curriculum gap between theories and practices without industry engagement in the curriculum development process for TVET system in Cambodia (ADB, 2016). Many students go to schools without learning anything because of irrelevant and traditional curriculum (Panth & Maclean, 2020). Training programs are found ineffective, hindering skills mismatches and skills gaps (ADB, 2020). Thus, limited quality TVET system is resulted from the mismatches between demand and supply of which curriculum is a core bridge (MoEYS, 2019).

The curriculum should be future-oriented to prepare learners to meet the emerging needs of technological innovation and the labor market (Panth & Maclean, 2020). Curriculum implementation is significant for schools that should be considered. The findings will provide learners with appropriate and relevant learning contents to ensure that the learning environment in the class is productive and concrete. Vocational subject clusters and general subject clusters can be classified in

terms of "work well, need immediate action, and need improvement". Technical education teachers will be guided functionally to modify subject clusters to meet the competency levels and interests of students. The findings will help policy makers and curriculum developers to guide their direction and focus. GTHS management will professionally report about teachers' instructional progress. Finally, GTHS management will be able to monitor and provide teachers instructional advice and guidance following the newly-updated curriculum.

The research objective is to assess the curriculum implementation effectiveness. Responding to the objective, three research questions were raised consisting of **(1)** What subjects work well for each trade? **(2)** What subjects need immediate actions for each trade? And **(3)** What subjects need improvements for each trade?

Literature Review

TVET creates jobs and employment for the people, alleviating poverty. To achieve this, the curriculum is one of the bridges that should be assessed radically regarding subject clusters, time allotment, contents, and objectives. The subject clusters (technical subject clusters and general subject clusters) reflect the labor market need and students' interests and competency levels. There are a lot of studies highlighting subject clusters capturing students' interests and competency levels that should be raised for discussion.

The royal government of Bhutan (2019) developed the TVET curriculum framework by putting an emphasis on literacy and numeracy

subjects such as English language and Mathematics. However, Roofe and Ferguson (2018), employing a qualitative content analysis approach to explore TVET curriculum contents at lower secondary level found the need to assess the curriculum contents and objectives because they lacked an alignment with one another in Jamaica. In Singapore at the secondary education level, technical students are required to study English language, mathematics and computer applications as supporting general subjects for technical courses (SEAMEO VOCTECH, 2020).

Regarding agriculture trade, Ruiz, Radtke and Scherr (2021), developing the nutrition curriculum for high school students and applying an expert review approach to assess the learning achievements found a vocational subject cluster consisting of food supply chain and food environments, nutrition lessons, cooking lessons including food safety, budgeting, and preparation. In other words, White et al. (2018), using a qualitative approach with an expert review and focus group to develop a *learn by actively participating* curriculum for youths explored three main subjects, namely gardening, culinary skills, and family conversation/interaction.

In Malaysia, the TVET curriculum is developed by schools following the occupational standards. The entrepreneurship subject is added into the curriculum to enhance self-employment for graduates (Unit, 2009). Afolabi (2014), examining the quality of accounting students in Nigeria in light of the private and public sector perception by surveying 350 participants from the private and public enterprises found that the computer skills subject and principle of accounting needed

to be added in the accounting and management curriculum.

Research Methodology

The research methodology is a crucial tool used to answer research questions to ensure that the results are empirical and scientific in nature. The rigorous systematic approaches are as follows:

Data Collection

The data was collected from the participants as technical education students currently studying year 2 at general and technical high schools (GTHSs) in Cambodia. The paper-based questionnaire, as part of self-reported appraisals, was filled out by the participants under a direct instruction by a team of researchers. The participants were gathered to sit and listen to researchers' instruction at one common hall at schools before filling out the questionnaire. Because they are high school students, they were also instructed not to copy or cheat from each other while completing the questionnaire.

The data was also collected from five GTHSs namely Community Development Institute; Kampong Chheuteal Demonstration GTHS; Sant Franscois GTHS; Preah Bat Samdach Preah Borom Neat Norodom Sihamoni GTHS; and Preah Norodom Sihamoni GTHS, located in five different provinces. The five GTHSs cover five trades consisting of electronics, electricity, agronomy, animal husbandry, and accounting and management. Electricity, electronics, and manufacturing are the main focus for Cambodia's industry-driven economy vision (Thomas,

2019). Moreover, modern agriculture has been applied to increase local food production. The accounting and management are the supporting trade for manufacturing. The criteria for GTHSs selection are (1) delivering any trade service from year 2; (2) the participants can be assessed by appointment; and (3) GTHSs follow the curriculum guideline on technical education at upper secondary level, issued by the Ministry of Education, Youth, and Sport (MoEYS) for their instructions.

Participant Selection

The target group is year 2 students currently studying at GTHSs. The selection criteria for participants are (1) finishing studying years 1 and 2 and ready for year 3; (2) currently studying at any trade at GTHSs; (3) volunteering to participate in the study; and (4) being committed to graduate year 3. The participants are from diverse backgrounds, as described in the descriptive statistics revealing age, sex, years of studies, trade, names of schools, and school province. No incentives were provided for the participants after filling out the questionnaire.

Research Method

The critical research questions can be answered by employing the quantitative research method. Particularly, the survey research using cross-sectional study design was applied to assess the participants' opinions and belief about the curriculum implementation effectiveness at one point in time (Creswell, 2012).

Data Analysis

To analyze data from the completed questionnaire from target participants, the importance performance analysis (IPA) approach was employed using SPSS version 25.0. IPA has been used to assess the quality-of-service deliveries or attributes in terms of importance and performance, particularly in education or tourism (Deng & Pierskalla, 2018). The IPA approach scatters attributes into four quadrants namely "concentrate here" as quadrant I, "keep up the good work" as quadrant II, "low priority" as quadrant III, and "potential overkill" as quadrant IV, as shown in **[Figure 1]**. The participants rate their perceptions on the provided attributes in terms of importance and satisfaction. The

Figure 1. Importance-Performance Analysis Grid

attributes might fall into each quadrant referring to the participants' perceptions. As a result, any attributes falling into quadrant III (low priority) and quadrant IV (potential overkill) mean that those attributes don't contribute to overall satisfaction and importance (Deng & Pierskalla, 2018).

Research Instruments

Questionnaire items capture five trades, namely electronics, electricity, agronomy, animal husbandry, and accounting and management for year 2 of the technical education curriculum for technical education at upper secondary level (MoEYS, 2015). The curriculum contents for the five trades are embedded in the questionnaire for student rating so that content validity was achieved. In addition, students from five GTHSs have been studying curriculum contents of five trades at their respective schools. Therefore, construct validity was ensured because a

measurement tool represents the thing be measured. Each trade has different items/contents with the same Likert type 5-point scale. For example, for electricity trade, item 1 mentions Math (3 hours a week) with a level of satisfaction. They range from not satisfying at all (1); not satisfying (2); neutral (3); satisfying (4); and very satisfying (5) for participant ratings.

Results

The results emerged from data analysis answering research questions. The demographic information of participants and GTHSs were shown in **<Table 1>**. The trades for each school were also highlighted in the table, capturing sexes and years of studies of the participants.

Electronics

The results were shown in the importance-performance matrix and importance-

Table 1. Demographic Information of General and Technical High Schools

No	Trades	Community Development Institute				Kampong Chheu-teal Demonstra-tion GTHS				Sant Franscios Private GTHS				Preah Bat Samdach Preah Borom Neat Norodom Si-hamoni GTHS				Preah Norodom Sihamoni GTHS			
		Male	Female	Total	Year 2	Male	Female	Total	Year 2	Male	Female	Total	Year 2	Male	Female	Total	Year 2	Male	Female	Total	Year 2
2	Electronics	20	8	28	28																
3	Electricity					29	3	32	32												
4	Agronomy	6	31	37	37					9	6	15	15					4	20	24	24
5	Animal Husbandary					8	40	48	48					5	9	14	14				
6	Accounting and Management	1	14	15	15																
	Sub total	27	53	80	80	37	43	80	80	9	6	15	15	5	9	14	14	4	20	24	24
	Grand Total	213																			

Table 2. Importance-Performance Rating for Electronics

Abb.	Attribute	N	Satisfaction		Importance	
			Mean	SD	Mean	SD
Kh	Khmer Language	28	3.75	0.7	4.12	0.77
Eng	English Language	28	3.5	0.92	4.04	0.72
M	Maths	28	3.68	0.72	4.15	0.83
AC	Administrative computer	28	3.5	0.92	4	0.75
C	Civics and Morality	28	3.57	0.92	3.65	0.89
PE	Physical education	28	3.43	1.14	3.62	0.85
P	Physics	28	3.75	0.93	3.81	0.94
FT	Foundation of telecommunication	28	3.46	1.32	3.62	1.44
CA	Circuit arrangement	28	3.25	1.4	3.58	1.33
MP	Mircro processor	28	3.32	1.68	3.27	1.71
CC1	Computer coding 1	28	3.46	1.55	3.35	1.57
PI	Project implementation	28	3.14	1.56	3.19	1.58

The table header row above spans "Electronics for Year-Two Students" and "Kampong Chheuteal Demonstration GTHS".

performance table. Only Kampong Chheuteal demonstration GTHS delivers this trade. 26 year-2 students filled out the paper-based questionnaire. The importance-performance rating was shown in **<Table 2>**. The 12-item scale showed a reliability of Cronbach Alpha α=.801 for importance and a reliability of Cronbach Alpha α= .697 for performance. The reliability levels were acceptable for further analysis.
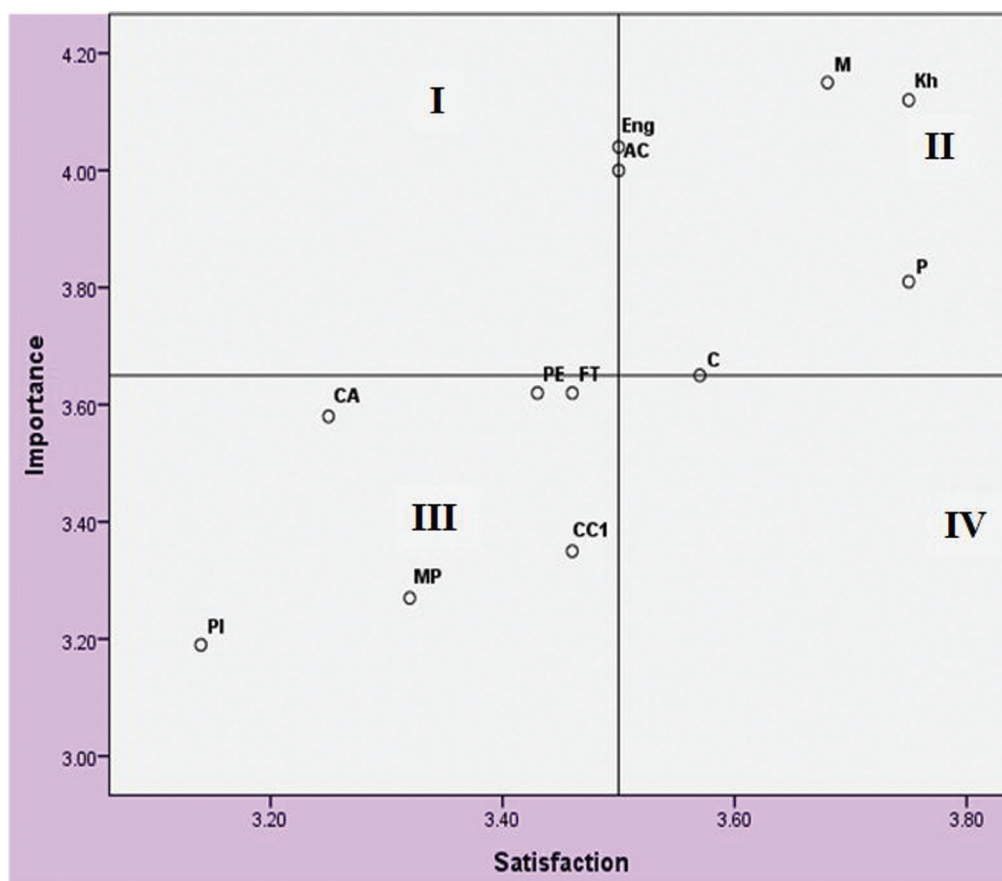
Resulting from importance-performance rating, a matrix of importance-performance was highlighted in **[Figure 2]**. There are 12 subjects requiring year-2 students to take courses in. No subjects fell into quadrant I. Three subjects, namely Maths, Khmer, and Physics fell into quadrant II. Six subjects, namely Project Implementation, Micro-processor, Computer Coding 1, Circuit Arrangement, Physical Education, and Foundation of Telecommunication fell into quadrant III. No subjects fell into quadrant IV. However, some subjects fell into the middle of two quadrants

such as Administrative Computer and English (Middle of quadrant I and II), and Civics and Morality (Middle of quadrant II and IV).

Electricity

Only Kampong Chheuteal GTHS delivers this trade. The results were shown in the importance-performance rating in **<Table 3>** and the importance-performance matrix in **[Figure 3]**. The 15-item scale showed a reliability of Cronbach Alpha α = .784 for importance and a reliability of Cronbach Alpha α = .700 for performance. The reliability levels were acceptable for further analysis.

Importance-performance matrix denotes four different quadrants separating different zones. Year-2 students are required to take courses of 15 subjects. The subject Computer Control fell into to quadrant I. Four subjects, namely Computer, Basics of Network, Khmer, and Technical Painting fell into quadrant II.

Figure 2. Importance-Performance Matrix for Electronics

Table 3. Importance-Performance Rating for electricity

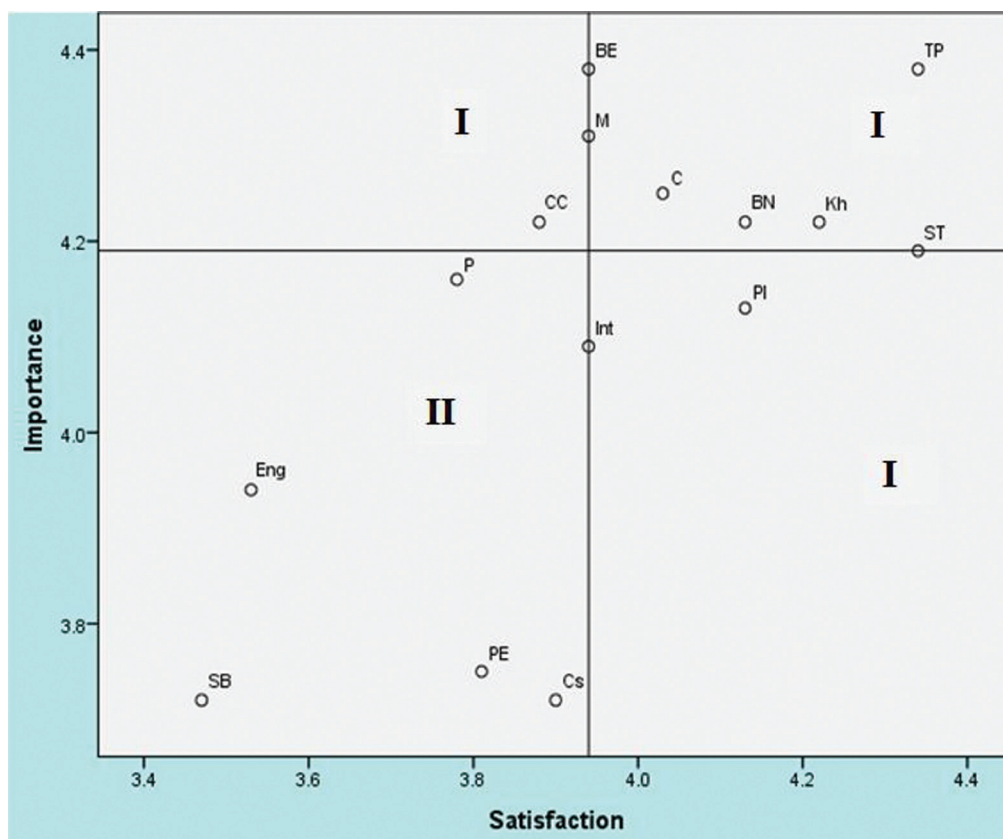| Electronics for Year Two Students						
Abb.	Attribute	Kampong Chheuteal Demonstration GTHS				
		N	Satisfaction		Importance	
			Mean	SD	Mean	SD
M	Maths	32	3.94	0.67	4.31	0.69
Kh	Khmer Language	32	4.22	0.55	4.22	0.61
Eng	English Language	32	3.53	0.98	3.94	0.88
C	Computer	32	4.03	0.78	4.25	0.67
Cs	Civics and Morality	32	3.9	0.79	3.72	0.81
PE	Physical education	32	3.81	0.97	3.75	0.8
P	Physics	32	3.78	0.91	4.16	0.72
BE	Basics of electricity	32	3.94	1.05	4.38	0.61
TP	Technical painting	32	4.34	0.65	4.38	0.61
BN	Basics of network	32	4.13	0.87	4.22	0.87
CC	Computer control	32	3.88	0.71	4.22	0.61
SB	Small-scale business	32	3.47	1.05	3.72	0.89
PI	Project implementation	32	4.13	0.79	4.13	0.87
Int	Internship	32	3.94	0.84	4.09	0.73
ST	Study tour	32	4.34	0.87	4.19	0.86

Five subjects, namely Small-Scale Business, English Language, Physical Education, Civics and Morality, and Physics fell into quadrant III. One subject Project Implementation fell into quadrant IV. However, some subjects fell into the middle of two quadrants consisting of Basics of Electricity and Maths (Middle of quadrant I and II), Study Tour (Middle of quadrant II and IV), and Internship (Middle of quadrant III and IV).

Agronomy

Total participants of 76 students from three GTHSs consisting of Community Development Institute (37 participants), Preah Sihanouk GTHS (24 participants), Saint Francois GTHS (15 participants) were assessed. The results were shown in Importance-Performance rating in **<Table 4>** and Importance-Performance Matrix in **[Figure 4]**. The 13-item scale showed a reliability of Cronbach Alpha α=.774 for importance and a reliability of Cronbach Alpha α= .723 for performance. The reliability levels were acceptable for further analysis.

Year-2 students are required to take courses of 13 subjects. Two subjects, namely Administrative Computer and Khmer Language fell into quadrant I. Two subjects, namely Maths and Techniques of Rice Planting fell into quadrant II. Four subjects, namely Research, Physical Education, Civics and Morality, and Survey and Village Arrangement fell into quadrant III. Two subjects, namely Biology and Clop Planting and Management fell into quadrant IV. However, some subjects fell into the middle of two quadrants consisting of English Language (Middle of quadrant I and II),
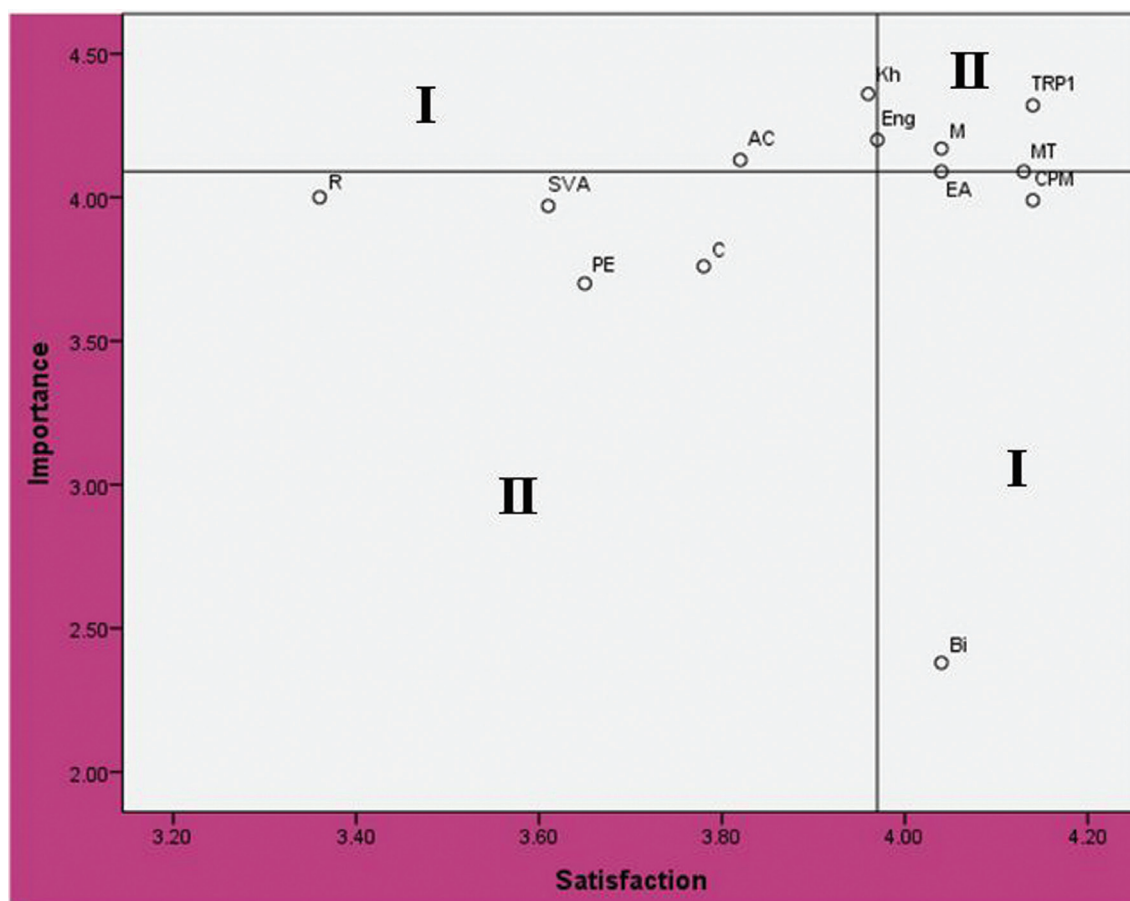

Figure 3. Importance-Performance Matrix for Electricity

Table 4. Importance-Performance Rating for Agronomy

		Year-Two Students				
Abb.	Attribute	Agronomy for 3 GHTSs				
		N	Satisfaction		Importance	
			Mean	SD	Mean	SD
Kh	Khmer Language	76	3.96	0.77	4.36	0.69
Eng	English Language	76	3.97	0.84	4.2	0.92
M	Maths	76	4.04	0.88	4.17	0.85
AC	Administrative computer	76	3.82	1.12	4.13	0.9
C	Civics and Morality	76	3.78	1	3.76	0.98
PE	Physical education	76	3.65	1.13	3.7	0.91
Bi	Biology	76	4.04	0.94	2.38	1.46
CPM	Crop planting and management	76	4.14	0.77	3.99	1.01
EA	Environment and agriculture	76	4.04	0.72	4.09	0.7
MT	Modern techniques	76	4.13	0.86	4.09	0.73
TRP1	Techniques of rice planting	76	4.14	0.96	4.32	0.96
SVA	Survey and village arrangement	76	3.61	1.25	3.97	1.12
R	Research	76	3.36	1.3	4	1.15

Figure 4. Importance-Performance Matrix for Agronomy

and Environment and Agriculture, and Modern Techniques (Middle of quadrant II and IV).

Animal Husbandry

Four GTHSs were assessed with 62 total participants for data collection. The 18-item scale showed a reliability of Cronbach Alpha α=.808 for importance and a reliability of Cronbach Alpha α= .752for performance. The reliability levels were acceptable for further analysis because the Cronbach Alpha is greater than .700. The results were shown in the importance-performance rating in **<Table 5>** and importance-performance matrix in **[Figure 5]**.

Among 18 subjects, Maths fell into quadrant I. Seven subjects fell into quadrant II consisting
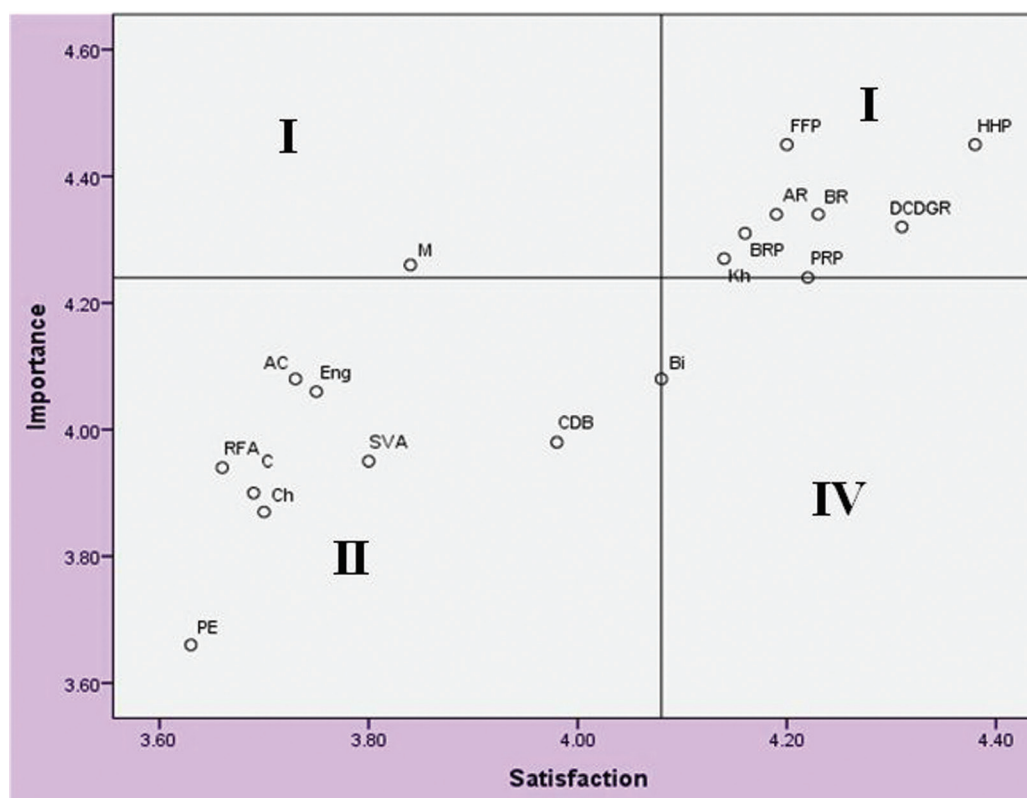
of food and food production; hatching and hatch preparation; animal reproduction; bird raising; domestic chicken, duck and goose raising; bird raising plan; and Khmer language. There are eight subjects the fell into quadrant III, namely administrative computer, English language, survey and village arrangement, cattle dairy breeding, research of farmers' activities, Chemistry, Civics and morality, and Physical education. Finally, two subjects fell into the middle of two quadrant II, III, and IV, namely pig raising plan and Biology.

Accounting and Management

One GTHS named community development institute consisting of 15 year-two students filled

Table 5. Importance-Performance Rating for Animal Husbandry

			Satisfaction		Importance	
Year Two						
Preah Bat Samdach Preah Borom Neat Norodom Sihamoni and Kampong Chheuteal Demonstration GTHS						
Abb.	**Attribute**	**N**	**Mean**	**SD**	**Mean**	**SD**
M	Maths	62	3.84	0.67	4.26	0.81
Kh	Khmer Language	62	4.14	0.66	4.27	0.89
Eng	English Language	62	4.14	0.66	4.27	0.89
AC	Administrative computer	62	3.73	0.95	4.08	0.96
C	Civics and Morality	62	3.69	0.92	3.9	0.88
PE	Physical education	62	3.63	1.12	3.66	1.16
Ch	Chemistry	62	3.7	0.63	3.87	0.86
Bi	Biology	62	4.08	0.76	4.08	0.86
HHP	Hatching and hatch preparation	62	4.38	0.7	4.45	0.62
FFP	Food and food production	62	4.2	0.86	4.45	0.78
BRP	Bird raising plan	62	4.16	0.76	4.31	0.67
BR	Bird raising	62	4.23	0.75	4.34	0.7
PRP	Pig raising plan	62	4.22	0.68	4.24	0.69
DCDGR	Domestic chicken, duck and goose raising	62	4.31	0.73	4.32	0.62
AR	Animal reproduction	62	4.19	0.81	4.34	0.63
CDB	Cattle dairy breeding	62	3.98	0.97	3.98	0.97
SVA	Survey and village arrangement	62	3.8	1.16	3.95	1.27
RFA	Research of farmers' activities	62	3.66	1.16	3.94	1.24

Figure 5. Importance-Performance Matrix for Agronomy

out the questionnaire. Students are required to study 12 subjects comprised of general subjects and vocational subjects.

The results were shown in importance-performance rating in **<Table 6>** and importance-performance matrix in **[Figure 6]**. The 12-item scale shown a reliability of Cronbach Alpha α=.700 for importance and a reliability of Cronbach Alpha α= .782 for performance. The Cronbach Alpha of more than .700 is acceptable for internal consistency for all items within the scale (George & Mallery, 2003; Joseph &Rosemary, 2003).

Among 12 subjects, Maths fell into quadrant I. Three subjects, namely Financial Accounting Implementation, Computer Skill Implementation, and English for Business 1 fell into quadrant II. Four subjects, namely Physical Education, Management Implementation, Civics
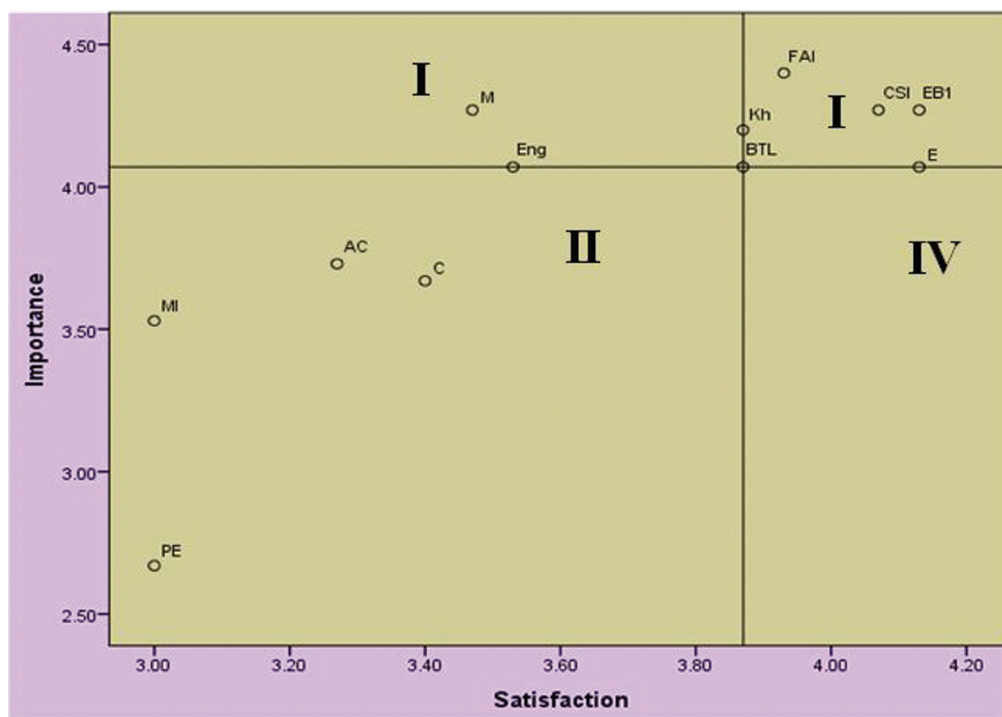
and Morality, and Administrative Computer fell into quadrant III. However, four subjects fell into the middle of two quadrants, namely English Language (Middle of quadrant I and III), Khmer Language (Middle of quadrant I and II), Economics (Middle of quadrant II and IV), and Basics of Tax Law (Middle of four quadrants).

Discussion and Conclusions

To assess the curriculum implementation effectiveness, some typical subjects were identified by falling into different quadrants among the four quadrants for each trade. For example, for electronics, three subjects, namely Maths, Khmer language, and Physics work well that should be intensified in light of year-2 students' perception. The general subject cluster helps support the graduates in seeking jobs (Kolawole & Ogungbade,

Table 6. Importance-Performance Rating for Accounting and Management

Abb.	Attribute	Community Development Institute				
		N	Satisfaction		Importance	
			Mean	SD	Mean	SD
Kh	Khmer Language	15	3.87	0.83	4.2	0.56
Eng	English Language	15	3.53	1.13	4.07	0.88
M	Maths	15	3.47	0.99	4.27	0.7
AC	Administrative Computer	15	3.27	1.03	3.73	0.96
C	Civics and Morality	15	3.4	0.74	3.67	1.11
PE	Physical education	15	3	1.2	2.67	1.18
E	Economics	15	4.13	0.64	4.07	0.59
FAI	Financial accounting implementation	15	3.93	0.88	4.4	0.74
BTL	Basics of tax law	15	3.87	0.74	4.07	0.46
MI	Management implementation	15	3	0.93	3.53	0.92
CSI	Computer skill implementation	15	4.07	0.7	4.27	0.46
EB1	English for business 1	15	4.13	0.64	4.27	0.8

Figure 6. Importance-Performance Matrix for Agronomy

2021). The students might have foundational knowledge and skills for these subjects. Six subjects, namely Project Implementation, Micro-processor, Computer Coding 1, Circuit Arrangement, Physical Education, and Foundation of Telecommunication need to be re-considered for modification and correction. Required resources should be allocated out. For electricity, the subject Computer Control can be considered for resource intensification otherwise it might be a problem. Four subjects namely Computer, Basics of Network, Khmer

language, and Technical Painting work well. They are fine and should continue to be implemented. Five subjects, namely Small-Scale Business, English Language, Physical Education, Civics and Morality, and Physics should be remarkably considered for modification and correction. One subject, Project Implementation, should be re-considered. This subject might be difficult and complicated for students.

For animal husbandry, Maths needs attention, meaning that year-2 students are not good at it. They should have extra classes part-time. Seven subjects consisting of food and food production; hatching and hatch preparation; animal reproduction; bird raising; domestic chicken, duck and goose raising; bird raising plan; and Khmer language work well, meaning that they might have more time in practice in reality at school or at home. There are eight subjects, namely administrative computer, English language, survey and village arrangement, cattle dairy breeding, research of farmers' activities, Chemistry, Civics and Morality, and Physical education that need modification and correction. These subjects might be difficult and don't capture students' interests. For agronomy, two subjects, namely Administrative Computer and Khmer Language need attention to be considered. More resources should be allocated for these subjects. Two subjects, namely Maths and Techniques of Rice Planting work well in light of students' perception and interests. Four subjects, namely Research, Physical Education, Civics and Morality, and Survey and Village Arrangement need modification and correction. These might be due to complexity. Two subjects, namely Biology and Crop Planting and Management need modification. Resources

should be moved out. The contents of these subject might not be relevant to the trade.

For Accounting and Management, Maths, they need more attention for resource mobilization. Maths teachers should pay more attention on this subject. Three subjects, namely Financial Accounting Implementation, Computer Skill Implementation, and English for Business 1 work well. This might be due to students' foundational background on these subjects, or teachers might teach well. Four subjects, namely Physical Education, Management Implementation, Civics and Morality, and Administrative Computer need modification and correction. It is consistent with Ai (2015) that vocational students in Malaysia are required to study Malay language, English language, Mathematics, and Islamic, Civics and Morality, and History.

The study has some limitations to be considered. There was only one male participant rating the questionnaire for accounting and management trade. 28 participants rated the questionnaire from one GTHS for electronics trade. There were 32 participants rating the questionnaire from only one GTHS. The future research should be undertaken to enlarge the number of participants with more GTHS and more trades.

Resulting from the findings, the TVET curriculum developers should revise the existing curriculum to capture students' interests to reduce dropout rates. Technical education teachers should apply a variety of teaching methods to engage students in learning such as inquiry-based learning, project-based learning, concept-based learning, etc. Teachers should design lesson plans putting emphasis on critical thinking and problem solving with

multidisciplinary learning activities (Tongchai, Wichaidit, & Koocharoenpisal, 2019). Problem-based learning encourages students' teamwork skills in inquiring new concepts (Kandaiah & Dollah, 2019). Finally, school management should guide and monitor teachers' teaching to ensure that they are on the right direction instructionally.

TVET curriculum implementation can be achieved fruitfully with stakeholder involvements such as students, teachers, school management, industries, government, and community. Exceptionally, teachers' tremendous contributions and efforts can be a catalyst used to achieve the curriculum objectives and syllabus (Ai, 2019). Curriculum developers, industry representatives, academic education teachers for general education subject clusters and vocational education teachers for vocational subject clusters might sit together to revise the curriculum following this study's results. If consensus can be reached among them, an integrated and standardized curriculum with holistic approach will be developed to close the demand and supply needs.

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Preparing TVET Teachers in Response to COVID-19 and Industry 4.0

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ABSTRACT

It is expected that Covid 19 and digitalization will have a deep impact on automation and a massive influence on employment and the workforce requirements. In response, TVET (Technical and Vocational Education and Training) must be able to stay relevant to the needs of labor market and seize the opportunities through the enhancement of qualified work and the profiling of occupations which could contribute to a stabilization and further development of the TVET systems. In this era, TVET should be able to prepare learners to be multi-skilled knowledge workforce, versatile, willing to learn continuously and able to acquire, apply and create knowledge, capabilities, and skills, particularly in modern technologies. Besides having the environment conducive for learning 21st Century competencies, teachers must have appropriate facilitation skills and didactical approaches, and the students need to be self-directed and self-reliant in learning. Based on the experience from conducting capacity building programmes to TVET teachers in Southeast Asia organized by GIZ-RECOTVET and SEAMEO VOCTECH in 2019 and 2020, this paper covers among others the changes in the world of work due to digitalization and their impact on workforce competency requirements, ways and strategies that TVET teachers must have on how to impart relevant the 21st Century abilities, how to condition self-reliant learning, and introduce the concept of learn- and work-assignments (LWAs)-- core elements of the didactic approach dealing with different requirements of TVET. This paper will also emphasize the importance of industrial experience and relevant digital competencies for TVET teachers.

Keywords: Technical and Vocational Education and Training (TVET), teacher preparation, digitalization, Industrial Revolution, pandemic responses

Introduction

At the global level, research findings reveal that in the next 10 to 15 years, about one-third of current jobs will change due to the impact of information technology, robotics, automation and artificial intelligence. Moreover, about 40 per cent of global workers will not have job-appropriate skills. Currently, the shortage of skilled workers and skills mismatch have resulted in six per cent GDP loss, equivalent to 5 trillion US dollars globally, every year. If countries concentrate on labour skill development, GDP growth can be boosted by up to two per cent." (World Economic Forum, 2016)

In ASEAN, digital technology and automation are changing ASEAN economies and societies. Many conventional jobs with low productivity are now diminishing, while technology- based jobs are emerging. Workers equipped with technical skills are poised to take advantage of these newly formed jobs." (The ASEAN's August 2020 Issue).

This technological trend has been exacerbated by current pandemic of Covid-19 that has disrupted the way we work, learn and live and capitalized the use of technology especially through online platforms. This Covid-19 has forced every country to have contingency plans either short, medium and long-term plan to minimize the adverse effect of the pandemic and to seize the opportunities that the adversity may offer. Based on OECD (2020) there are TVET policy and practices in coping with Covid-19: short-term or coping strategy, mid-term or managing the challenges, and long-term to improve and accellerate the inititiaves. The short-term policy and practices are meant to reduce learning losses while schools are closed and support the emergency response through skills training. The mid-term strategies are to promote learning recovery as schools and businesses gradually reopen. The long-term strategy is to build on innovative policy responses and lessons learned during the first two phases and build back better programmes.

Teachers as one of the pillars in education is in the forefront in confronting the challenges, preparing for suitable contents and deliveries, navigating complex health requirements and protocols and assuring quality of education during the difficult time. For that reason, they must be prepared and are continuously developed both in the pre-service and in-service teacher education and training.

This paper tries to explore various strategies in preparing TVET teachers during pre-service teacher education and in-service teacher training for suitable contents, pedagogy, and modalities to be an effective teachers in the era of digitalisation and in response to the pandemic challenges.

Methodologies

This paper was based on two rounds of a regional (10 Southeast Asian countries) training programmes on Innovative Teaching and Learning for Industrial Changes Due to Industry 4.0 organised by SEAMEO VOCTECH and GIZ-RECOTVET and feedbacks from participants. The first round was conducted in-person in Bangkok Thailand on 5 to 16 August 2019 attended by 26 master trainers and the second round was delivered on 23 to 27 November 2020 online using Thinkific as the learning management

platform attended by 15 master trainers. A survey was also conducted to the alumni of the training and directors or school principals who sent the participants to gather their feedback and suggestions to improve the training programmes. In addition, the paper was also based secondary data and literature reviews from various studies, particularly those with the context of TVET in the era of digitalisation and in response to the Covid-19 pandemic.

Findings

1. Competencies to be included in the pre-service education and in-service training programmes

a. Responding to IR 4.0 according to Impuls and Regional TVET Teacher Standards (RTTS) for ASEAN.

According to Impuls (2015), TVET institutions should pay attention to the three pilars: process, technology, and organisation in order to be ready for Industrial Revolution 4.0 (IR 4.0). The first pilar, the process covers curriculum relevant to the new technology, engagement of various stakeholders to stay connected and to share resources, and pedagogy relevant to impart fast changing competencies. Vocational education is constantly changing to meet future trends; the institutions must be able to transform rapidly; the curriculum should address or integrate IR 4.0 technology, such as big data, augmented reality (AR), simulation, Internmet of Things (IoT), Cloud Computing, etc. Considering that running TVET programmes is very costly especially to meet the technological requirements, and the requirements from industry are always changing, the institutions must collaborate with relevant industry. IR 4.0 is about current and future technology; TVET teachers must adopt and provide future skills and implement innovative pedagogy and self-reliant learning.

The second pilar of TVET in the ear of IR 4.0 or in short VE 4.0 or TVET 4.0 is the technology including having up-to-date facilities, intelligence, and connectivity. The school infrastructure should be fully equipped to adopt digital innovation; learning facilities are conducive for technological development, good internet connectivity, and user friendly Learning Management System (LMS) that can be accessed remotely and the teachers can analyze students' learning based on real time data. The technology should be able to manage risk and cyber-security.

The third pilar of TVET 4.0 is the organisation which covers the structure and management as well as talent readiness. To be TVET 4.0 ready, the institutions should have IR4.0 in the organization's vision and mission, policies that encourage the institution to adapt/embrace/transform IR4.0 related technologies, and have strategies/plan to implement IR4.0-related technology. In addition, the TVET teaching personnel is capable to adopt IR4.0-related technology, has training plans in place to develop their capabilities, skill & competencies and the school has set up a task force to drive IR4.0 integration.

Pertaining to TVET teacher competencies according to Impuls (2020), teachers should have competencies on digital literacies, how to integrate IR 4.0 technology, and master innovative pedagogy, including vocational didactics and learning theories, especially self-

reliant learning in the context of learn and work assignments. The implementation of project- and/or problem-based learning is one of the approaches that has high degree of self-reliant learning.

This is also in line with Regional TVET Teacher Standards (RTTS) for ASEAN (SEAMEO VOCTECH and GIZ, 2020) that TVET teachers should posses two competence areas: (1) personal and social competence area, and (2) vocational discipline, research, didactics, pedagogy and management. Considering that in ASEAN Member States, TVET teachers comprise four types or groups of occupation[1], the above requirements are particularly relevant for those teaching vocational and technical courses or TVET school teachers, trainers and instructors, and in-company trainers. Personal and Social Competences describe the competences of a TVET teacher to become acquainted with the TVET school as an institution, with the underlying system and personal attitudes for a constantly further developing of own skills and competences. Vocational Research, Discipline, Didactics, Pedagogical and Management Competences describe the competences for identification, preparation and implementation of teaching with a focus on occupations in the vocational field and based on competences in a vocational

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1   Acording to Euler (2018) and Parsons et al. (2009), there are four different types of TVET teacher: (1) General teachers with a focus on general education subjects, (2) TVETschoolteachers with a focus on theoretical knowledge, (3) Trainers and instructors with a focus on practical exercises, and (4) In-company trainers with a focus on training and work-based learning in companies.

discipline. Vocational Research is competences of TVET teachers for determining occupational competence requirements, developments of the occupations and teaching requirements. Vocational Discipline is competences of TVET teachers for analysing the occupational subject (Manufacturing, Automotive, etc.) and the referred requirements and changes in the world of work. Vocational Didactics deal with how to choose and structure relevant contents and methods for supporting vocational learning processes. Vocational Pedagogy is competences of TVET teachers for planning, carrying through and assessment of learning sessions. Lastly, Vocational Management is competences of TVET teachers for organizing and further developing vocational schools and vocational education programmes (SEAMEO VOCTECH and GIZ, 2020, p.40).

The TVET teacher competences identified under Impuls (2015) and SEAMEO VOCTECH and GIZ (2020) are very relevant to be included in pre- service and in-service education and training, particularly in preparing them for IR 4.0.

b. Responding to Covid-19:
   ▪ E-learning

One of the salient strategies in response to Covid-19 that has been affecting teacher's roles is teaching-learning through online and virtual platform and blended modes (OECD, 2020). Consequently, during the pre- and in- service training, there is a need to prepare and develop teachers so that they will be able to use technology for continuence of learning due to Covid-19 disruptions. Improving teachers' digital skills is important both during pre- and in-service training. OECD (2020) warns that

"while distance learning cannot completely replace in-person training, and its effectiveness depends on the occupation, it can nonetheless help learners to remain engaged and continue to make progress in their studies. These efforts at online delivery and communications can enhance one-to-one digital and real-world interactions between learners, learning providers and employers."

- ▪ Support for rapid assessment and respond to emerging skills

Teachers should be able to support for rapid assessment and respond to emerging skill needs by designing new or expand current TVET programs in collaboration with industries. TVET teachers should be able to prepare for flexible learning solutions such as flexible work-based learning and creating online platforms and virtual simulator training contents (OECD, 2020; The World Bank, 2020; ILO, 2020; Majumdar and Araiztegui, 2020).

- ▪ Micro modular and credential and recognition of prior learning (RPL)

Teachers should be aware of and offer micro modular or courses to provide more flexible arrangements to the students and trainees. These micro modular courses eventually will lead to micro credentials that can be recognised for further leaning and for employment.

Recognising the prior learning of adults from various learning and working experience can be achieved through a standalone assessment and/or portfolio. In the sectors withshortages or expected shortages such as medical and health care sectors, some countries are issuing short-term, fast-track licenses thus offring flexible skills assessment and awarding

of qualifications is necessary, especially in the time of crisis (OECD, 2020).

2. Various Modalities for acquiring relevant TVET competencies:

a. In the classroom and workshop

For the pre-service education for TVET teachers, formal learning at teacher training centres or university is the most common accompanied by some working experience in industry. For in-service TVET teacher training, the development can take place in a training centre, industry, or TVET schools. During the time of crisis, it is high time to leverage the links between work-based and school-based TVET (OECD, 2020).

For in-service teacher training and development, special areas of capacity development to maintain the relevancy of the TVET competencies and to refresh vocational didactics and pedagogy are necessary. Updating the digital skills, responding to the competencies required for IR 4.0, updating technical and vocational competencies by participating in industrial attachments are amongst the contents and strategies to be considered during Covid-19. Considering the chalanges faced by some teachers to attent normal caopacity building programmes, the TVET managers may consider flexible, ubiquitous, and micro content deliveries.

Based on the experience of the first round regional training programmes organised in-person by SEAMEO VOCTECH in collaboration with GIZ-RECOTVET on deliveries of module title **Innovative Teaching and Learning for Industrial Changes Due to IR 4.0** in 2019,

participants rated highly on the two-week training programme. Using Likert scale of 1 to 5 (1 is poor and 5 is excellent), 23 participants rated the first week of the programme on the intructors was 4.49, training deliveries were 4.37, venue and facilities were 4.57, and meeting expectations and satisfaction were 4.41. During the second week, the participants also rated higly in the 4 areas mentioned: the instructors were rated 4.54, the training deliveries were rated 4.40, the venue and facilities were rated 4.44, and on the meeting expectations and satisfaction were rated 4.39. (SEAMEO VOCTECH, 2019).

During the second round, the training programme were delivered online for the duration of one week, instead of two, in 2020 in the mist of Covid-19. This online training was using Thinkific as the platform for the Learning Management System and participated by 15 participants. Out of the 15 participants, 13 responded to the course evaluation and the results shows that they rated highly. Using the Likert scale of 1 (poor) to 5 (excellent), the respondent rated the facilitators 4.5, the online facility was rated 4.5, the software and technical tools were rated 4.1, the navigation of the online course and online platform were rated 4.0, meeting the expectation was rated 4.25, and level of satisfaction was 4.42. In the general comments, participants expressed their preference for in-person training than online, especially in delivering hands-on practical skill contents. (SEA-VET Learning, 2020).

Using the Learn and Work Assignment (LWA) model, this course consists of 4 components: LWA1 was on "New paradigm: the changes of management- and work- processes and consequences for the workforce due to Industry 4.0"; LWA 2 was on "Man-machine communication, optimization of automation and consequences for the workforce and security"; LWA 3 was on "Process management, optimization of automation and guarantee of process and data safety"; and LWA 4 was on "Planning of teaching lessons and use of multifunctional didactical approaches for deepening understanding of digital-based/modern industry".

Based on the experience of the two regional training programmes on Innovative Teaching and Learning for Industrial Changes Due to IR 4.0 during Covid-19 pandemic, the 36 participants have provided inputs 6 months after the second round of the training for the improvements of the next programmes. The feedbacks are summarised as follows:

- Participants frequently used Zoom, Google Meeting, Google Classroom, Moodle, MS Teams, and Kahoot to support their online lessons.

- In order for the TVET institutions to deliver training on IR 4.0 related topics, they totally need a vision for further development of training in a digitalized world has to be created (70% or respondents), curricula have to be updated to cover Industry 4.0 requirements (60%), and rooms have to be prepared and updated with digital equipment (57%). In addition, 39% of them perceived that they need further development of teamwork to manage the digital transformation.

- With regards to digital competencies of TVET teachers in the region, they strongly need competency to develop digital

teaching and learning materials (75% of the respondents), to communicate with learners to conduct an online classroom (63%), and to organise an online classroom (51%). In addition, 48% of them perceived that they need competencies to administer—which is more than just organising materials online, but also setting the LMS and registration-- online classroom.

- Pertaining to the need of slightly complex digital tools, 60% of them perceived that they strongly need the tools to ommunicate with learners to conduct an online classroom, to integrate digital teaching and learning materials to fit pedagogical and methodological lesson plans and to communicate with learners to conduct an online classroom (57%). In addition, they perceived that they need the tools to administer an online classroom (72%) and to organise an online classroom (57%). Slightly complex digital tools are videos, Learning Management System (LMS), E-learning platform, Adobe Captiva, Cloud system, Open Educational Resources (OER), Data analytic tools, Google classroom, and remote support software.

- Pertaining to the need of advanced digital tools e.g., AR, VR, AI, coding, and simulation software, they perceived that they strongly (totally) need the tools to develop digital teaching and learning materials (63%), to enhance pedagogical and professional practices (57%), and to communicate with learners to conduct an online classroom (51%). In addition, they need advanced tools to organise an online

classroom (54%), and to administer an online classroom (45%).

- Pertaining to digital competencies related to data privacy and protection, 94% of respondents perceived that practise data privacy and protection to protect sensitive data of learners, teachers and contents as well as restrict access to resources as appropriate when conducting online classroom/training; 63% responded that they totally need data privacy and protection training, and 64% of them responded that they need to apply the copyright rules to the digital resources for school purposes (images, text, audio and film).

- Other digital competencies that the respondents added are webserver, robot technology, 3D printing/additive manufacturing, data visualization, digital citizenship, 3d-CAD, automation designing, simulation software, and video editing/ making and transmission.

- Pertaining to preferences and online learning environment of TVET teachers, 67% of them undertook self-pace learning in MORNING, 94% of them used LAPTOP for online learning, 55% of them had good internet connection, and 94% of them used WIFI for online learning.

b. Industrial attachments

Some countries under ASEAN are encouraging TVET teachers to participate in industrial attachments after certain period of time (every 1 to 3 years) such as in Singapore and Thailand. During Covid-19, this can be performed online as practiced under SEA-TVET

Exchange Programmes by several colleges and universities in the Philippines and Indonesia and those in Malaysia and Indonesia (SEAMEO, 2021).

Conclusions and recommendations

Conclusions

Based on the background and findings of this study, the followings are some conclusions to be presented in bullet points:

- The use of sophisticated technology in industry has affected fast changing future of work and jobs.
- Digitalization as an instrument of automation and Covid 19 pandemic will lead to a massive loss of jobs depending on the country and the sectors. However, new jobs will be created and the workforce must be prepared and re-trained accordingly. VE must be able to response by enhancing various components that support to VE 4.0 and TVET teachers must be prepared accordingly.
- In preparing for the TVET teachers through pre-service education and in-service training programmes, relevant contents must be integrated in response to IR 4.0 requirements including digital literacies, how to integrate IR 4.0 technology, and master innovative pedagogy, such as vocational didactics and learning theories, especially self-reliant learning in the context of learn and work assignments.
- The contents of pre-service education and in-service training programmes for TVET teachers should also refer to RTTS covering (1) personal and social competence area, and (2) vocational discipline, research, didactics, pedagogy and management.
- In response to the challenges due to Covid-19 pandemic, TVET teachers should have competencies in E-learning and digital competencies to support rapid assessment and to respond to emerging skill needs, to be aware of and offer micro modular or courses to provide more flexible arrangements to the students and trainees.
- Providing various modalities for acquiring relevant TVET competencies such as in the in the classroom, workshop and industrial attachment.
- Continue improving capacity building programmes both in-person if possible and/or online by considering the input from participants and experts such as enhancing teachers' digital competencies, mastering both less complex and advanced digital tools, as well as data privacy and protection. This will help them to communicate with learners to conduct an online classroom, to integrate digital teaching and learning materials to fit pedagogical and methodological lesson plans.

Recommendations

In brief, the paper offer the following recommendations:

- Prepare and develop teachers so that they will be able to use teachnology for continuence of learning due to Covid-19 disruptions. Improving teachers' digital

skills is important both during pre-service education and in-service training.

- Teachers should be able to support rapid assessment and to respond to emerging skill needs by designing new or expand current TVET programs in collaboration with employers.
- Prepare for flexible learning solutions such as flexible work-based learning and creating online platforms and virtual simulator training contents.
- Diversify learning areas and education and training modalities and new quality assurance systems.
- Facilitate modular training and micro-credentialing in TVET and life-long learning.
- Integrate vocational didactics during the pre- and in-service education and training.

The above recommendations are relevant for the policymakers at the national level who are in charge for preparing TVET teachers, the school principals and directors of TVET colleges in preparing for continuous professional development for their teachers, and for teachers themselves in preparing for the professional development to meet the needs of current and future TVET skills and pedagogical competencies.

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Mathematics, Data Science and AI Education in the University of Tsukuba

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ABSTRACT

The University of Tsukuba was founded 150 years ago in 1872 as Japan's first institution of higher education, and reorganized 49 years ago in 1973 as Japan's newest national comprehensive research university and a leader in reforming the Japanese university system. Since its founding, the university has been characterized by an education that integrates the humanities and sciences, and has made informatics a compulsory subject in all undergraduate courses. Today, information literacy has become an essential basic knowledge for all people, and in response to the demand for the development of human resources to lead education in mathematics, data science, and AI, the University of Tsukuba has established a new systematic program based on its history of producing human resources to lead this field, and is taking on the role of disseminating this new program to the world.

Keywords: Information literacy, JV-Campus, interdisciplinary skills, education, research

Introduction

Since the time of the founding of the University of Tsukuba in 1973, the University made two credits of the subject "information literacy" a compulsory subject for all undergraduate students, including arts and humanities students. The University of Tsukuba is a comprehensive university with wide range academic fields including Physical education, Sports, and Art and Design. So, the University of Tsukuba made a prescient decision at the time of its foundation (1).

Providing specialized Education

In 1977, the University of Tsukuba established the College of Information Sciences in the Third Cluster of Colleges to provide specialized education in this field. Graduates of the College of Information Sciences include Yoichi Ochiai,

associate professor of the university and famous media artist (2); Daiyu Nobori, manager of the Industrial Cyber Security Center of the Information-Technology Promotion Agency, Japan, president of SoftEther Corporation, and professor of the university's Industry-Government-Academia Co-Creative Producer (3); Yukihiro Matsumoto, developer of the Ruby programming language (4); and other outstanding leaders in this field. In relation to Art and Design, John Maeda, research professor at MIT Media Lab, and STEAM movement leader in the USA (5).

The first Master's and Doctoral programs in this field were established in 1978 and 1981, respectively, and have continued to be organized and develop up to today. Last year, six students have been selected for the Ministry of Economy, Trade and Industry's Exploratory IT Human Resources Development Project for 2021, and two of them have been certified as super creators in the same project. This means that the University of Tsukuba has the largest number of future leaders on this field.

The Process to Establish the Program

In 2019, in addition to "information literacy", which has been offered since the opening of the university, two credits of data science were made compulsory for the entire University, and together they constitute a literacy-level program in mathematics, data science, and AI education. In 2021, this educational program was selected as a Literacy Level Plus, which is one level higher, by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) in its accreditation system for mathematics, data

science, and AI education programs. So far, only ten universities and one college of technology in Japan have been selected for the Literacy Level Plus.
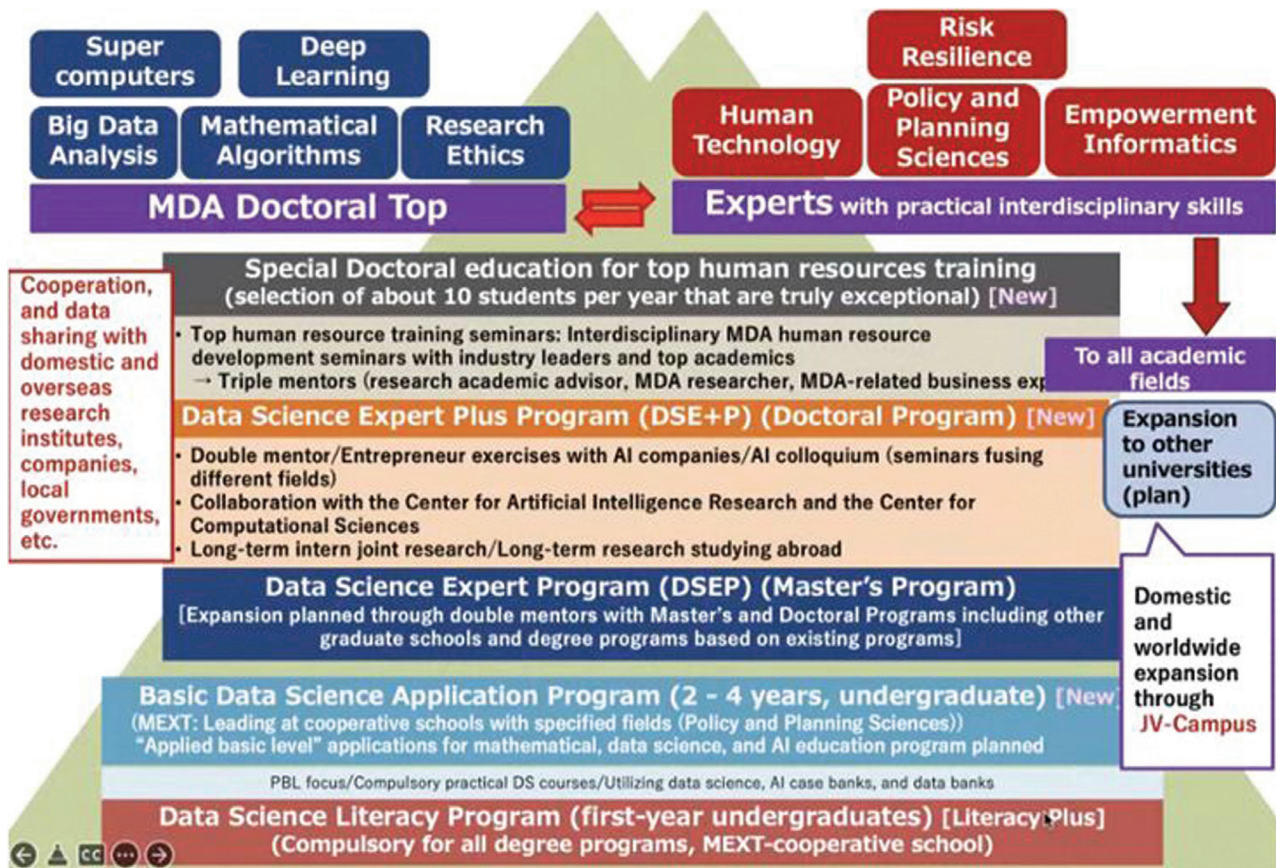
University of Tsukuba has established the Headquarters for the Promotion of Interdisciplinary Mathematics, Data Science, and AI Education in order to build a consistent educational system for education in this field for multiple levels and various target students. In addition, starting on 2022, the University has been selected along with ten other universities as a base school for the Ministry of Education, Culture, Sports, Science and Technology's nationwide project to promote the development of mathematics, data science, and AI education, and is expected to nurture top human resources who will lead education and research in this field.

Figure 1 shows the concrete contents of this interdisciplinary mathematical, data science, and AI education programs.

Next Steps

Based on our achievements in advanced mathematics, data science, and AI education and research, we will add a doctoral education program that applies our strengths in interdisciplinary research to develop top and expert human resources who can lead the creation of innovations and the development of interdisciplinary IT human resources that can contribute to the achievement of the SDGs.

The top doctoral personnel in the MDA field are leaders who specialize in this field with expertise in supercomputing, mathematical algorithms, big data analysis, deep learning, etc., and in human

Figure 1. *Interdisciplinary mathematics, data science, and AI education programs of University of Tsukuba.*

technology, social engineering, cybernetics, risk resilience, empowerment informatics, etc. In collaboration with interdisciplinary experts in each of these fields who utilize information technology, we will expand our research and education using information technology to all academic disciplines. Yoshiyuki Sankai (6,7) a founder of Cybernics says "Cybernics is a new academic field that is to solve human and social problems which developed countries are facing. It is a new academic field that is centered around human, machine, information fused/combined with various other fields including brain/neuroscience, behavioral science, robotics, information technology, artificial intelligence, system engineering, psychology, philosophy, ethics, low and business administration" (8).

In addition, we will expand this educational program to all Japan and the rest of the world through the JV-Campus distance learning program, for which the university has been selected as a base school (9).

Excellent researchers and engineers in the IT field belong not only to universities, but also to research institutes and companies in Japan and abroad. University of Tsukuba has been conducting education and research activities in cooperation with researchers and engineers outside of the university through the Cooperative Graduate School (10) and the Collaborative Graduate School (11, 12). We will continue to collaborate with domestic and international research institutes, companies,

and local governments to share data and promote joint education and research.

Future tasks

The MDA education at the university will consist of five levels of programs, starting with the Data Science Literacy Program, which has already been certified as Literacy Level Plus. The national government has announced that it will launch an accreditation system for undergraduate applied basic programs above literacy this year. Prior to this, our school has been selected as a cooperating school in the field of social engineering for the specific field of this applied basic level, and we will develop a program to be accredited for the applied basic level that will start in the future.

Furthermore, in addition to the doctoral course top human resource development program that was adopted as a base school this year, we will establish both doctoral and master's course expert development programs based on the university's track record in interdisciplinary research and education, which is a characteristic of the university, to develop human resources who can pioneer new academic fields and promote innovation in society by making full use of MDA in their respective fields of specialization, and master's programs to develop human resources who can use MDA in their respective fields of specialization to pioneer new academic fields and promote social innovation.

This year, the University of Tsukuba began its activities as a designated national university that conducts top-level education and research on par with other top universities around the world. The University of Tsukuba has the largest and greenest campus in Japan with on campus housing for over 3,000 students, forming an international community with the largest number of international students of any national university in Japan, a wide range of research fields not found at other national universities including physical education, sports and arts and design, and is located in a super science city within one hour from Tokyo. As the core of the company, it plays a leading role in Japanese academia and education, not only in the fields of mathematics, data science, and AI, but also in all other fields. As a university that contributes to the sustainable development of the world, including the achievement of the SDGs and carbon neutrality. We expect it to continue to develop further in the future.

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Semantic analysis of a lesson in an online program: A focus on Japanese Terminology

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ABSTRACT

The objective of this paper is to illustrate how the lessons of an online program were analysed through a semantic processing method with the purpose to share the incorporation of necessary terminology for designing curriculum, textbooks and lessons in mathematics education. With this aim, a lesson of the online course 'Teaching Mathematics to Develop Mathematical Thinking as Higher Order Thinking: How do you teach? Why?' created by CRICED-University of Tsukuba for the SEAMEO School Network served as an example of the implementation. Recommendations for future revisions are made such that fundamental mathematical ideas in the introduction of numbers and operations are included.

Keywords: Online course, terminology, semantic processing, occurrence network

Introduction

As previously explained in Isoda, Solis & Lopez (2021), an online program was developed through international cooperation for the SEAMEO School Network as a pilot study with two backgrounds: the first one was the implementation difficulty of the SEA-Teacher program and the second one was the necessity to share the terminology for designing curriculum, textbooks and lessons in mathematics education as the subject to develop higher order thinking skills as mathematical thinking. On the previous paper, the establishment of the project up to evaluation from participants was reported. On this paper, a description of the implementation process is provided with the purpose to share the incorporation of the necessary terminology. Firstly, the necessity and principles of the program are described. Secondly, the well-defined content for practices in designing the program's lessons are shown. Thirdly, the method of analysis to describe the program's lessons is explained. Fourthly, the case of one lesson is used as an example to show the semantic processing method.

Necessity and principles of the online program.

Regarding the adaptation of textbooks and the description of curriculum standards, one major difficulty has been identified: the lack of terminology which is necessary to design curricula, textbooks and lessons by themselves (Montecillo, Teh & Isoda, 2018). Such terminology has been developed by Japanese teachers and educators for lesson study since the 19th century to conceptually distinguish the content of individual materials, to describe the task sequence and learning trajectory in the instructional system, to indicate what challenges a task entails, to contribute to design task sequence and evaluation, to distinguish which of the children's ideas that emerge in class are based on prior learning, to explain which lack of understanding emerged, and to examine what tasks the teacher should plan for and whether they are appropriate as future learning. The curriculum standards for each country, even in the case of Japan, do not include all necessary these terms because curriculum standards as a part of the law are kept to a minimum number of words to differentiate the content among grades. As a result, teachers have usually limited opportunities to learn and use the necessary terminology. In the case of Japan, these words are known as content of mathematics teacher education.

The online course 'Teaching Mathematics to Develop Mathematical Thinking as Higher Order Thinking: How do you teach? Why?' was created for the SEAMEO School Network as a necessary program to develop mathematical thinking and share Japanese terminology to design better curricula, textbooks and lessons. It responds to SEAMEO's priority area No.5, revitalizing teacher education and priority area No.7, adopting 21st century curriculum. As a collaboration between countries' institutions, the program gathered invited speakers from the following institutions: SEAMEO RECSAM (Malaysia), SEAMEO QITEP in Mathematics (Indonesia), Khon Kaen University (Thailand), Vietnam National University (Vietnam), University of the Philippines (Philippines), Pontificia Universidad Catolica de Valparaiso (Chile), and Universidad Pedagogica Nacional (Mexico). The program was focused on the introduction of numbers and operations up to 3rd Grade and was designed as 20 consecutive pre-recorded lessons which required sequential participation. Every lesson was developed by professor Masami Isoda with the contribution of the invited speakers from the above mentioned institutions. Lessons were distributed to participants through YouTube Live Streaming. A full description of the program's schedule is available in Isoda (2021). As explained by Isoda, Solis & Lopez (2021), the program was developed under four principles:

i. Aims of mathematics education: develop students who learn mathematics for themselves.

ii. Nature of mathematics curriculum: mathematization which re-organize the mathematical experience, explained by extension and integration and also by conceptualization and proceduralization.

iii. Role of teachers and educators: designers of learning such as in curriculum and textbook by developing task sequence.

iv. Students as learners: challenge the unknown task by using what they already learned through the past tasks and prepare

Designing the lessons: Focusing on the introduction of numbers and operations

Well-defined content for practices on the introduction of numbers and operations have been described in SEAMEO Basic Education Standards: Common Core Regional Standards in Mathematics and Science (SEA-BES:CCRLS) (Mangao, Ahmad, & Isoda, 2017) and training books (Teh, Isoda, & Gan, 2021). These content justify both the designed structure and hypothesized key words that compose the terminology for each lesson in the online program.

As a description of the domain's general purpose in lower elementary school mathematics, the following subsections describe the larger context of interpretation tied to learning and teaching opportunities regarding the introduction of numbers and operations, the ways of thinking, mathematical values, and mathematical modelling:

(a) Whole numbers are introduced and called "numbers" in 1st Grade until a differentiation is needed in 3rd Grade to separate them from decimal numbers and fractions. Whole numbers are represented by the decimal notation system and emphasis is placed to understand the difference of ordinal and cardinal numbers while using them appropriately in situations (Teh et al., 2021). At this point is important to clarify that prior to the introduction of addition and subtraction, "how many" is operationally driven by the numerical composition

and decomposition. Additionally, sets of objects can be compared by "one to one correspondence and recognize larger, smaller or equal with appreciation in drawing paths between objects" (Teh et al., 2021, p.6). Here, a set is defined by an attribute which requires the definition of a unit for counting (denomination). Lastly, the representation in the decimal notation system is summarized by considering numbers through units of ten, hundred, and thousand.

(b) Addition is introduced in 1st Grade as a binary operation. The meaning of this operation is introduced with "situations (together, combine, and increase) for addition and explain it with manipulatives and orally" (Mangao et al, 2017, p.16). Subtraction is also introduced as a binary operation and the meaning of this operation is introduced with various situations such as left (take away) and difference (comparative). Additionally, subtraction as the inverse operation of addition is defined in later grades. After the introduction of the meaning of addition and subtraction as a binary operation, the mental calculation of addition is proceduralized from composition of numbers while subtraction is proceduralized from decomposition of numbers. Then, for the extension of operations with numbers larger than ten, addition as composition of numbers is integrated with decomposition of numbers by making sets of ten. Finally, for the extension with multiple digits in vertical form, addition as decomposition and composition of numbers is integrated

with the base ten system by using block representation.

(c) The way of thinking, particularly "think about how to calculate", is focused on the composition and decomposition of numbers and grouping by ten. In later grades, the calculation in each place value with multiple digits is extended. The main goal is "thinking about the easier ways for addition and subtraction and producing vertical form with algorithms" (Mangao et al, 2017, p.18). This involves thinking how to improve the calculations by learning the commutative and associative law, carrying up (addend/augend decomposition) and carrying down (minuend/subtrahend decomposition).

(d) There are mathematical values that are expected to be fostered by engaging in the learning of mathematics such as usefulness, simplicity, generality, efficiency, reasonableness, and beautifulness (Mangao et al, 2017). For example, in the case of whole numbers, the representation through the decimal notation system by place value allows an easier and concise way to compare the magnitude of numbers. In the case of problem solving, analysing from multiple perspectives, then looking back on various representations, and finally thinking about new solution methods.

(e) On mathematical attitudes, "changing representation to other ways such as modelling can overcome the running out of ideas in problem solving" (Mangao et al, 2017, p.6). For this, mathematical expressions, such as the ones involving addition and subtraction, are essential in the translation of scenes from daily life into the world of mathematics. This process also includes using concrete and semi concrete objects. In this context, a mathematical model is used to idealize everyday events such that learned concepts and principles can be used to mathematically solve problems. During the modelling process, mathematical expressions not only allow to describe events more accurately, but also supports flexible communication of thoughts and ideas.

One of the necessities to develop the teacher training books by Gan, Isoda & Teh (2021) and Teh et al. (2021) were that there are no corresponding and appropriate materials in the official or preferable textbooks in some countries for clear understanding of SEA-BES:CCRLS in Mathematics and Science. For knowing and understanding materials in Mathematics, we preferred to use Japanese textbooks, English translation of Gakkotosho publisher, as for teaching materials because it have been consistently incorporated these content for developing students who learn mathematics by and for themselves, make use of what they have already learned and consider what they should do differently, and on these reason it has adapted in SEAMEO countries and APEC economies such as Thailand, Indonesia, Papua New Guinea, Chile and Mexico.

Method of analysis: Semantic processing

As intended by the design of the pre-recorded lessons, the main lecturer and invited speakers engaged in discussions that were justified

by the well-defined content for practices in the introduction of numbers and operations. Serving as a comparative base to the accepted discursive components, the repetitive patterns in actions and use of key words and narratives by the lecturer and speakers composed the enacted routines. By relying on the transcription of both the audio and the written expressions in each pre-recorded lesson, the analysis of these enacted routines become the best way to confirm the implementation of the Japanese terminology. This enacted routine was the main communication mean that connected the lecturer and speakers with the participants. Given that the analysis of the pre-recorded lessons was based on the literal transcription of verbal and written expressions composed by large amounts of text, a text mining approach composed by statistical and computer linguistic methods was selected to semi-automatically extract semantic structures (Wiedemann & Niekler, 2017).

Text mining approach

The selected semantic processing method for the transcription of the prerecorded lessons was the analysis by significant co-occurrences. This means identifying tokens that occur more frequently per context of analysis (i.e. paragraphs, sentences, and neighboring words) than expected by chance. After calculating the statistical significance of the co-occurrence among two tokens, the "ranking of globally most significant word pairs can be used directly as an indicator for possible idiomatic usage" (Bordag, 2008, p.53). Accordingly, the semantic environment of the tokens was visualized by co-occurrence networks. These networks depended on the co-occurrence ranking generated from a two level analysis: primary co-occurrence and secondary co-occurrence (Wiedemann & Niekler, 2017). Primary co-occurrence is composed by the 10 most significant co-occurring tokens with the most frequent term in the transcription; secondary co-occurrence is composed by the 10 most significant co-occurring tokens with each of the 10 tokens identified in the primary co-occurrence. As recommended by Bordag (2008), loglikelihood was used as the statistical measure for co-occurrence significance.

Analysing one pre-recorded lesson: The case of Lesson #2

Justified by the well-defined content for practices, this section describes the designed structure (including hypothesized key words) and the enacted routines by the lecturer and speakers in Lesson #2. The enacted routine is analysed by making a semantic processing of the transcription of the pre-recorded lesson. The idiomatic usage is explained through the significant join occurrence of tokens within the transcription of both verbal and written expressions. The results from the analysis of significant co-occurrence is summarized through an occurrence network.

The case of Lesson #2

This lesson was designed to generate a discussion surrounding the following questions and topics:

What is necessary for counting activity? The difference of making sense and sense making. What shall we do for sense making? Why you set your task sequence? Why you would like to

teach such an order? Japanese textbook has the task sequence for using learned and preparation for future learning. Mathematical Thinking as for objective or a framework for research.

According to the designed structure for Lesson #2, the following list includes the hypothesized key words that compose the terminology of the lesson:

content, mathematical thinking, mathematical process, mathematical activities, mathematical value, mathematical attitude, habits for human character, acquisition, higher order thinking skills, reflection, appreciation, challenge by and for themselves, aim, objective, using learned before, task for preparation, task to apply learned, mathematical idea, set, unit, compare, generalization, specialization, ten as one word, ten as two digits, cardinal number,

ordinal number, number, denominated number, concrete object, semiconcrete object, the idea of set, one to one correspondence, comparison, zero, permanence of form, Peano axioms, larger or smaller, general, special, task, sequence, counting procedure, first object, direction of counting, last object, arrangement, beautifulness of numbers, increase by one, step, what already learned.

After pre-processing the transcription of Lesson #2, the analysis only considered the tokens that occurred at least 5 times. This resulted in a total of 110 tokens with a corpus size of 414 sentences. Additionally, the following neighbouring words were identified as multiword tokens: mathematical thinking, higher order thinking, task sequence, one correspondence, one-word, concrete object,
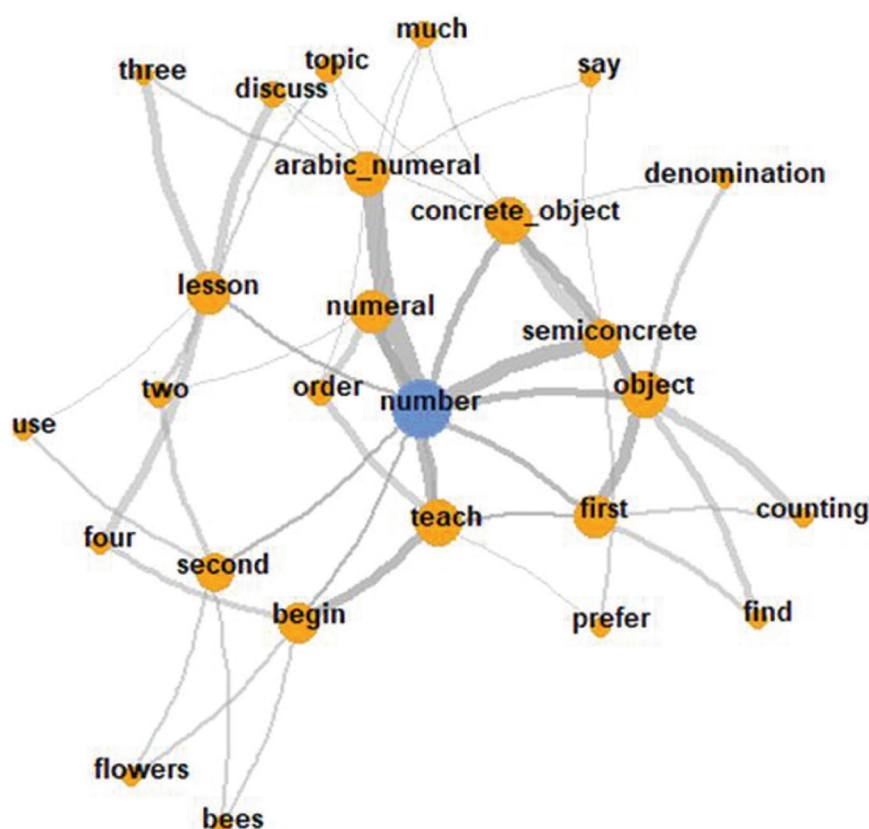

Figure 1. *Occurrence network Lesson #2: Main token "number".*

Table 1. *Most frequent tokens in Lesson #2.*

Most frequent tokens in Lesson #2.

Token	Frequency	Token	Frequency	Token	Frequency
number	38	lesson	11	one one corresp.[b]	9
one	35	develop	11	mathematical	8
three	29	children	11	discussed	8
numbers	28	object	11	idea	8
two	27	think	11	difference	8
can	27	denomination	11	b	8
order	18	thank much	11	six	8
yes	16	say	11	case	8
counting	16	objects	10	general	8
need	15	kind	10	terminologies	8
many	15	textbook	10	arabic numeral	8
first	15	c	10	introduce	7
students	14	japanese	10	page	7
math. thinking[a]	14	thank	9	process	7
vietnamese	13	learning	9	explained	7
teach	13	find	9	bees	7
question	12	like	9	also	7
things	12	example	9	grade	7
set	12	last	9	unit	7
ten	12	zero	9	usually	7

Note: [a]Mathematical thinking. [b]One one Correspondence.

number three, Arabic numeral, denominated number, addition subtraction, using learned, make sense, sense making. The most frequent token was "number", becoming the focus point for the co-occurrence analysis. The resulting semantic environment is shown in Figure 1 represented through an occurrence network.

Regarding the semantic processing, the idiomatic usage can be summarized by three main sections. First, there is a clear differentiation between the usage of Arabic numerals and the way in which the numerals are read in each language. Second, the translation activities using concrete and semi concrete objects require the definition of units for counting (denomination). Third, the teaching sequence of the lesson is defined as a preparation towards generalization. For example, beginning the task sequence by

discussing the one-to-one correspondence between flowers and bees. These are reasonable results as for the explanation of content at the introduction of number.

Discussion

The semantic processing of the pre-recorded lessons from the online program 'Teaching Mathematics to Develop Mathematical Thinking as Higher Order Thinking: How do you teach? Why?' proved the identification of Japanese terminology described in the well-defined content for practices for the introduction of numbers and operations. On the other hands, major mathematical ideas such as the "idea of set" were missing in the occurrence network. This is particularly significant because, during the introduction of numbers, the "idea of set"

is fundamental in thinking about membership and in the definition of the unit for counting (denomination). Indeed, on Table 1, the token "set" was repeatedly used during the pre-recorded lesson, however the semantic processing method didn't show any significant co-occurrence with other tokens in the analysis. It is weakness of semantic processing method because it is not the methodology for semiotic analysis on interpreters. On the perspective of semantic processing, it concludes that the idea of set is still unclear in relation to other words at Lesson #2.

Conclusion

This paper described the implementation process of the online program 'Teaching Mathematics to Develop Mathematical Thinking as Higher Order Thinking: How do you teach? Why?' created with the objective to share necessary terminology for designing curriculum, textbooks and lessons in mathematics education. According to the results from this pilot study, future analysis will require a revision of the semantic processing method such that fundamental mathematical ideas in the introduction of numbers and operations are included. We may need the further course to explain what mathematical thinking in general is because the previous course more focused on the terminology to distinguish conceptual difference and task sequence which are necessary for designing.

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Past and future of teacher education in Japan: Considering the modality of practical experiences during the COVID-19 pandemic

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ABSTRACT

Teachers in Japan have regularly conducted lesson study with both colleagues in their schools and teachers from other schools. Due to the COVID-19 pandemic, these training opportunities have been reduced. Information exchange activities for groups that researched and discussed teaching methods have also stagnated.

In Japan, the pandemic has forced us to rethink the essential meaning of teaching practicum and in-service training. The COVID-19 disaster has also revealed the stagnation in the use of ICT (Information and Communication Technology) devices in Japanese school education. International comparisons has made this a hot topic in Japan since ICT devices were recognized as a major issue in ensuring children's learning during school closures. In response to this, Japan decided to make subjects related to ICT use a compulsory part of the teacher training course. However, simply promoting teachers' use of ICT equipment without examining why Japan lags behind other countries in its usage and identifying the challenges in introducing new tools into school education will not be enough to achieve learning outcomes for children. In this paper, we discuss how to develop the new skills that teachers require to use technology, while taking over the existing teacher training and in-service teacher training.

Keywords: In-service training, teaching practicum, Japanese education, ICT devices

Introduction

Teacher education in Japan has emphasized the importance of "practice" for a number of years. This has been embodied in the teaching practicum and in-service training in particular lesson studies in the schools. However, the COVID-19 pandemic made it difficult to create practical training opportunities where face-to-face communication was required. In the early days of the pandemic, this difficulty was a major issue for teacher training institutions at all levels.

The Ministry of Education, Culture, Sports, Science and Technology (MEXT) has taken measures to set a flexible duration for the teaching practicum, but it is still unclear how the shortened duration will change the outcome of teaching practice. As of this writing, Japan is facing the sixth wave of the pandemic, and it is difficult to plan the duration of practical training because it is largely dependent on the spread of infectious diseases. In recent years, both universities and local boards of education have attempted to provide practical experience as practicum training to students who want to become teachers, but these efforts will come to a halt under the pandemic.

First, this paper describes the structure of teacher education in Japan and its emphasis on practical experience, particularly educational practicum. It then considers the impact of the COVID-19 pandemic on teacher education in Japan, focusing on the limitations of educational self-study, and points out that the use and application of ICT devices is being sought as a new practical experience. Based on these considerations, we will discuss the future of teacher education in Japan.

The structure of teacher education in Japan

The concept and framework of "teacher education" originated from the growing international common understanding of the professionalism of teachers raised by the ILO/ UNESCO Recommendation concerning the Status of Teachers (1966). In 1974, as part of the OECD Expert Meeting on Teacher Policy in 1974, "New Patterns of Teacher Education, and Tasks" was published. This paper included a number of recommendations on "continuity and the discussion on progressive stage in training". With the 1975 UNESCO "The Changing Role of the Teacher: International Perspectives", a framework for teacher education was conceived that consisted of teacher training, recruitment, and training.

The long-term perspective on improving the qualifications of teachers was influenced by the development of lifelong education concept that emerged in the late 1960s was reflected in the 1971 OECD report "Training, recruitment and utilization of teachers in Primary and Secondary Education". Discussion about the framework of teacher education as a step-by-step and continuous process and how it related to lifelong education began with "The James Report: Teacher education and training" by the British Council on Educational Relations in 1972. The gradual and sequential concept of "personal education", "preservice education", "induction", and "in-service education" had a major impact on subsequent teacher education reform and teacher research (The Study Group on Contemporary Teaching, 1989, p.5).

In Japan, the importance of improving the quality and ability of teachers through the process of training, recruitment, and training was shown in the 1978 Central Council for Education Report "On the Improvement of Teachers' Qualities and Abilities". The concept of lifelong learning is also important in Japan, and this perspective continues to influence the way teacher education is conducted in Japan today.

Figure 1 shows the structure of teacher education in Japan. Education is divided into three phases: pre-service, teacher recruitment, and in-
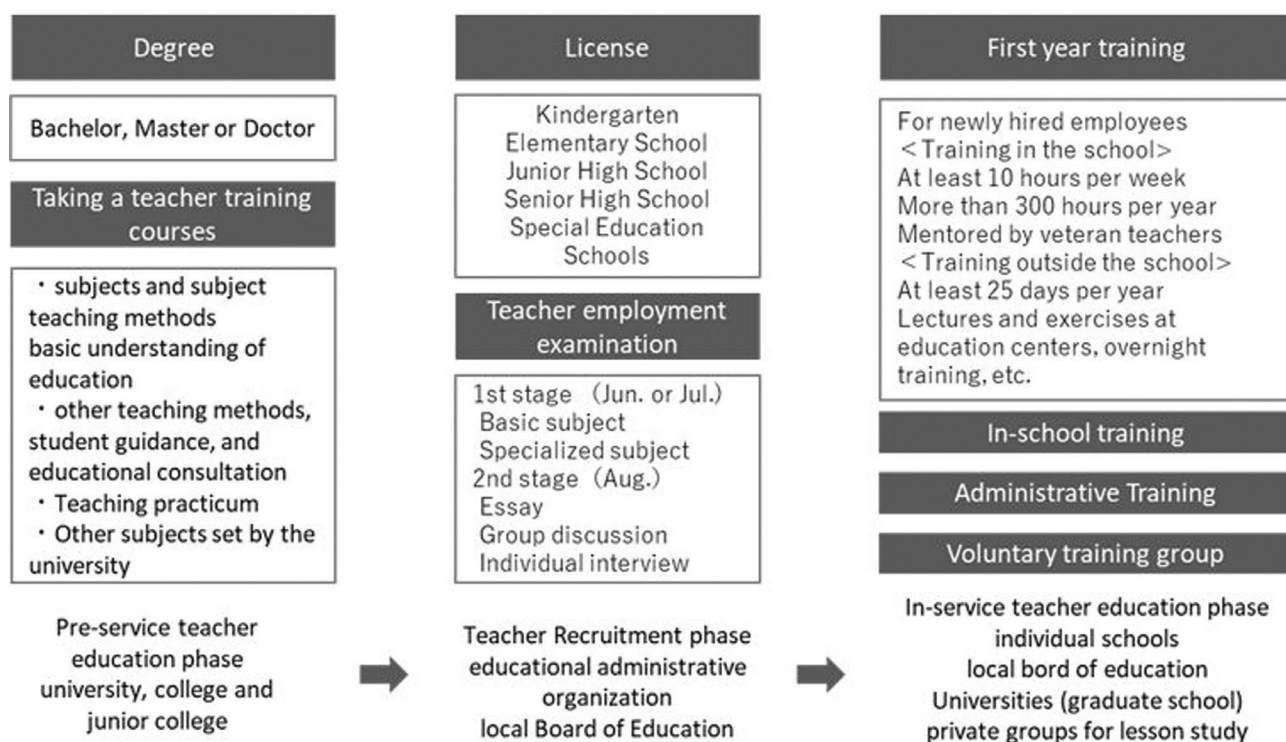
Figure 1. *Teacher education system in Japan.*

service teacher education. In Japan, a teacher's license is awarded by the local government based on the degree and credits earned in the teacher training curriculum. Teacher recruitment examinations are conducted by each local government. After entering the vocation, in-service teachers participate in a year of initial training as well as other training programs.

How practical experience has increased and being practical has become more important

When obtaining a license to teach kindergarten, elementary school, or junior high school, prospective teachers are required to complete about 150 hours of teaching practicum, and about 90 hours are required for high school teachers. The actual length of time students spend in school is generally three or four weeks in each school. Universities must coordinate the timing and duration of teaching practicum with

local boards of education and individual schools that accept students. Many universities offer teaching practicum from the third year through the summer of the fourth year.

In fact, the number of hours of teaching practicum required in Japan has gradually increased. In the 1980s, student delinquency, violence, and bullying became major problems throughout Japan. The term "practical ability" was frequently used to train teachers how to deal with these issues. In 1989, the initial teacher training program, which is mandatory for teachers who have passed the teacher employment examination and have been appointed to their positions, was institutionalized. The number of required hours of teaching practice was also increased as follows.

1. In 1954, kindergarten & elementary school: 120 hours; junior high school, high school: 60 hours.

2. In 1989, kindergarten & elementary school: 150 hours; junior high school, high school: 90 hours.

3. In 1998, kindergarten, elementary school & junior high school: 150 hours; high school: 90 hours.

In the last decade, a compulsory course called "Practical Teaching Seminar" has been introduced in Japanese teacher training programs. Thus, the emphasis in Japan is on practical application of skills.

Table 1 shows the objectives, contents, and methods of the Practical Teaching Seminar. Methods of the seminar involving practical experience such as role-playing, group discussions, practical skills, fieldwork, and mock classes. The course is generally taken in the fourth year (7-8 semesters), and creating a "course record" to document what has been learned throughout the training program is a legal requirement.

Figure 2 shows an example of a "course record." Student teachers must complete a course sheet for all courses taken on the student's personal page. For all courses taken, students complete the chart by writing comments in the box.

National response to COVID-19 infections, especially in teaching practicum and promotion of ICT device usage

However, during the pandemic, it is naturally not possible to secure enough time for teaching practicum. After March 2020, when the schools were closed, MEXT issued three notices regarding the implementation of teaching practicum in teacher training programs. Figure 3 shows the measures taken by MEXT regarding changes in educational training in response to COVID-19 spread.

First, MEXT published the "Regarding the flexible implementation period of educational practicum (Notice)" on May 1, 2020. This document stated that no more than one-third of classes could be conducted on-campus during fiscal year 2020. However, this direction was limited to cases where educational effects could be demonstrated as equivalent to previous educational practices.

Second, MEXT published the "Partial Revision of the Ordinance for Enforcement of the School Personnel Licensing Act, etc. (Notice)" on August 11, 2020. This notice stated that credits from subjects other than educational practice
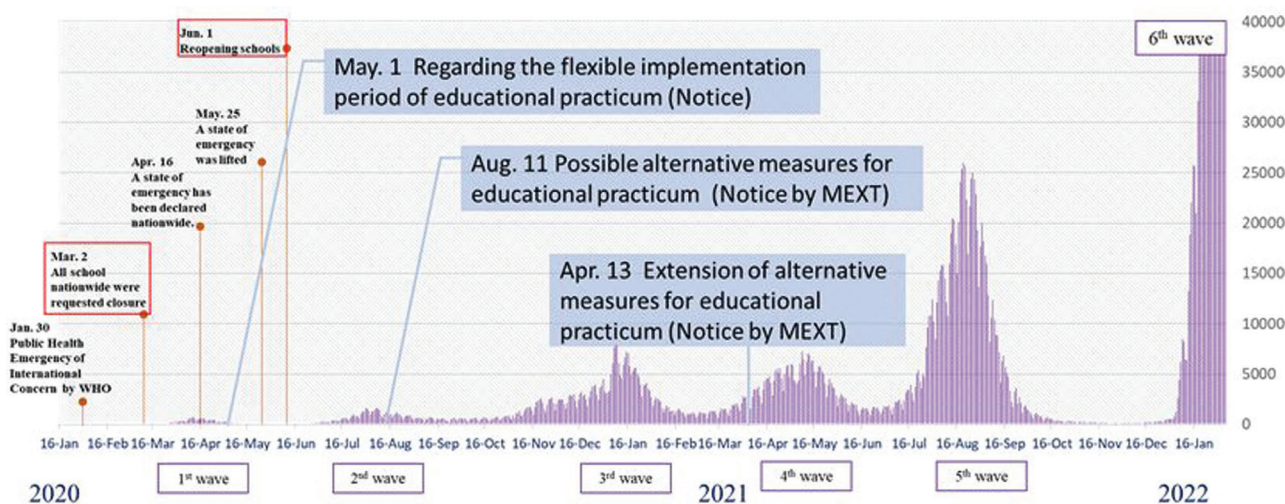
Table 1. Objectives, Contents, and Methods of the Practical Teaching Seminar

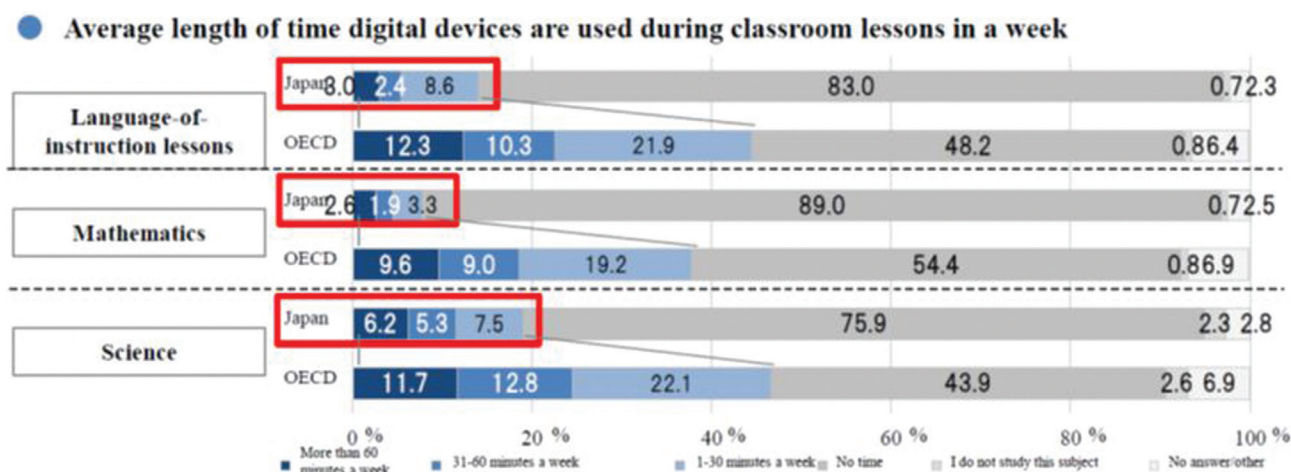| Objectives	Ensure that students acquire the entire range of qualities and abilities that are minimally necessary as teachers, and explicitly confirm the entire range of these qualities and abilities.
Contents	Matters related to 1) sense of mission, sense of responsibility, educational love, etc. 2) social skills and interpersonal skills 3) understanding of infants and children, classroom management, etc. 4) teaching skills in subjects and childcare contents, etc.
Methods	Lectures, role-playing, group discussions, practical guidance, practical training, case studies, fieldwork, mock classes, etc.

Figure 2. Example of a "course record".

Figure 3. *COVID-19 infections per day in Japan and measures concerning educational practicum.*

could be used in lieu of educational practicum, if necessary when it was not possible to conduct classes for the practice subject. However, since the course is a subject of educational practicum, it should be conducted as practical training and exercises enable students to comprehensively understand the actual situation of school education through experience.

Third, MEXT published the "Partial Revision of the Ordinance for Enforcement of the School Personnel Licensing Act, etc. (Notice)" on April 1, 2021. MEXT also stated that the above exceptions would be extended for the fiscal year 2021. The teaching practicum could then be replaced by mock classes, university exercises, and volunteer activities at schools,

● **Average length of time digital devices are used during classroom lessons in a week**

Figure 4. *Average length of time digital devices are used during classroom lessons in a week (Adapted from National Institute for Educational Policy Research, Ministry of Education, Culture, Sports, Science and Technology (2019) Key Features of OECD PISA 2018, p.10).*

making it possible for students to obtain a teaching license without completing the teaching practice.

The COVID-19 pandemic in Japan has revealed another major problem related to pre-service and in-service teacher training. Figures 4 and 5 show the results of PISA 2018 by the OECD, which indicate a lag in the use of ICT equipment in Japan. Students in Japan use digital devices in schools for the shortest period of time (Figure 4) in OECD countries. In addition, about 80% of students who responded "I don't have time," which was the highest among OECD member countries. A survey conducted by the MEXT in April 2020 about home learning during the temporary holidays showed that 1) 24% of students learned through TV broadcasts, 2) 10% of students learned at home using class videos created by the board of education, 3) 29% of students learned at home using other digital textbooks and digital teaching materials, and 4) 5% of students learned at home through simultaneous interactive online instruction. In the TALIS 2018 (OECD, 2019), Japanese
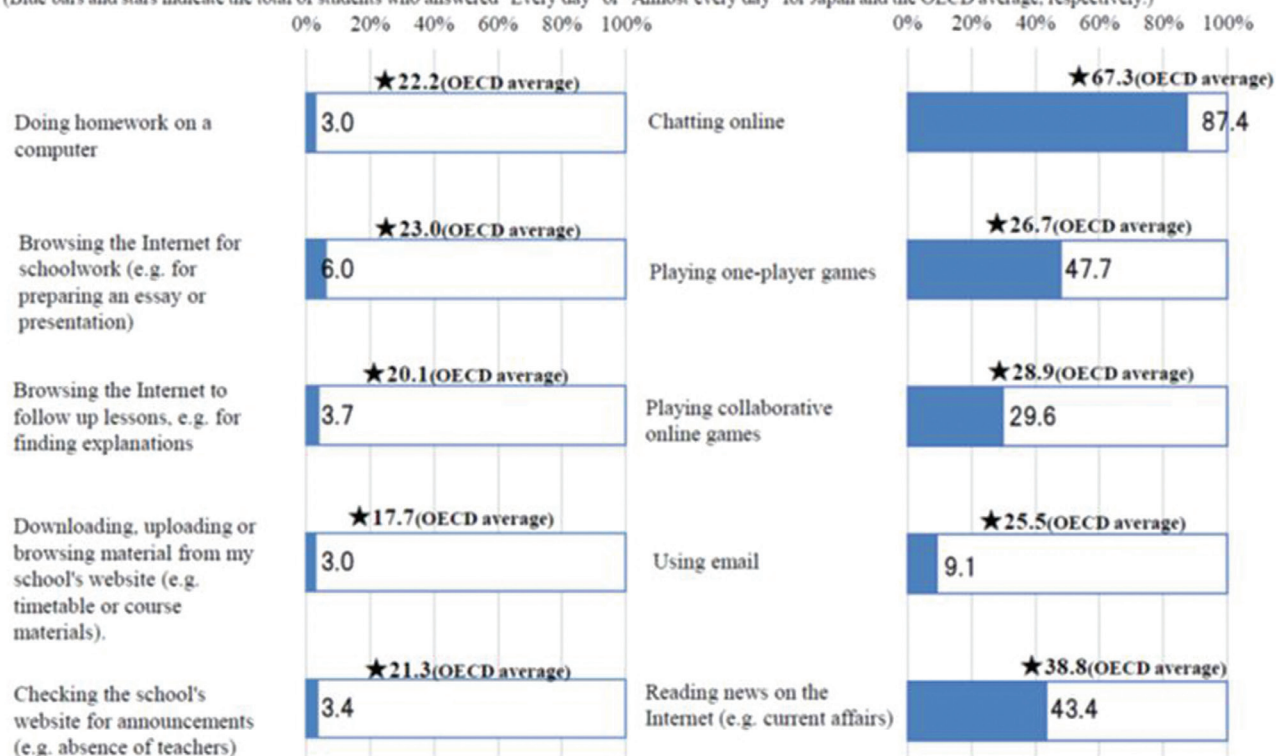
teachers had the highest percentage of needs for professional development in "ICT skills for teaching" among participating countries. Japan also saw the highest value of growth from the 2013 survey to the 2018 survey among the participating countries.

Students' use of digital devices for homework and other learning is clearly lower than in other OECD countries. On the other hand, a high percentage of students use digital devices for chatting and online games (Figure 5).
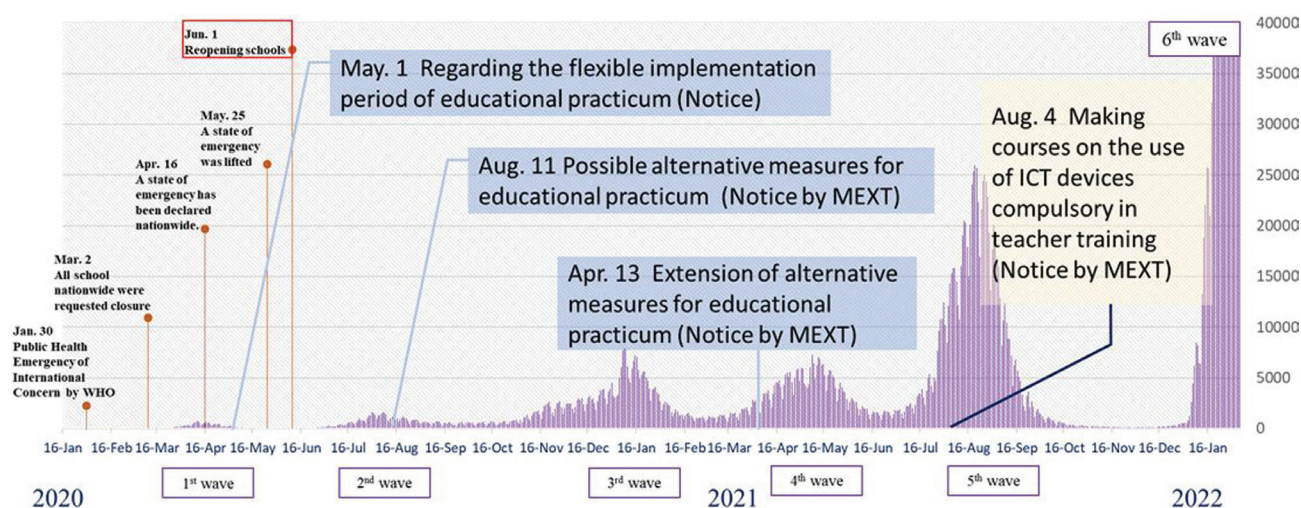
MEXT stated that courses about using ICT devices would become compulsory in pre-service teacher education on August 4, 2021 (Figure. 6); in April 2022, MEXT decided to make "Theories and Methods of Educational Using ICT" a compulsory subject. Students who aspire to become teachers will learn how to effectively use devices to teach various subjects, how to create digital teaching materials, how to implement distance education, and how to teach students to develop morals when handling the devices.

● **Use of digital devices outside of school during weekdays**
(Blue bars and stars indicate the total of students who answered "Every day" or "Almost every day" for Japan and the OECD average, respectively.)

	0% 20% 40% 60% 80% 100%		0% 20% 40% 60% 80% 100%
Doing homework on a computer	★22.2(OECD average) 3.0	Chatting online	★67.3(OECD average) 87.4
Browsing the Internet for schoolwork (e.g. for preparing an essay or presentation)	★23.0(OECD average) 6.0	Playing one-player games	★26.7(OECD average) 47.7
Browsing the Internet to follow up lessons, e.g. for finding explanations	★20.1(OECD average) 3.7	Playing collaborative online games	★28.9(OECD average) 29.6
Downloading, uploading or browsing material from my school's website (e.g. timetable or course materials).	★17.7(OECD average) 3.0	Using email	★25.5(OECD average) 9.1
Checking the school's website for announcements (e.g. absence of teachers)	★21.3(OECD average) 3.4	Reading news on the Internet (e.g. current affairs)	★38.8(OECD average) 43.4

Figure 5. *Use of digital devices outside of school during weekdays (Adapted from National Institute for Educational Policy Research, Ministry of Education, Culture, Sports, Science and Technology (2019) Key Features of OECD PISA 2018, p.10).*

Figure 6. *COVID-19 infections per day in Japan and making courses on the use of ICT devices compulsory in teacher training.*

Future of teaching practicum and being practical: Trigger a reflection and improvement

The future of teacher education curriculum emphasizing practical experience

In Japan, the teacher training program curriculum has changed since 1980's to ensure that teachers got as much field experience as possible. However, the COVID-19 pandemic has reduced the amount of practical experience that can be achieved in the teacher training curriculum. On the other hand, there will be more learning opportunities regarding the use of ICT devices, but this is not the same as practical experience in the school setting. The question that needs to be considered here is how much experience in an educational setting is necessary.

Although the duration of the teaching practicum in Japan is shorter than in other countries, research has shown that the pressure, anxiety, and hardships for student teachers are greater than in other countries because of the program (Iwata, 2021). This is because student teachers are more concerned than necessary about their appearance and attitude towards the mentor teachers. The reduction in the number of hours of teaching practicum may lead us to reflect on the content of teaching practicum we have accumulated so far, and to consider what practical experience is really necessary.

In post-pandemic education, an unprecedented approach is needed to ensure the competence of teachers who have no classroom teaching experience. Being treated as a full-fledged teacher and expert as soon as one becomes a teacher is a major characteristic not found in other professions (cf. Lortie, 1975). For

example, in Japanese schools, it often happens that even first-term teachers have to perform the same duties as veteran teachers. This is why teacher training is expected to provide practical experience and to be immediately effective upon entering the workforce. The emphasis on practical experience has shaped the culture of teaching in Japan. Perhaps this professional culture needs to be changed.

In Japan, The Study Group on Contemporary Teaching (1989), which pioneered and empirically examined the continuity of teacher education in the 1980s, approached this topic by considering the institutions and systems involved in teacher education, which was an exact opposite to what had been done previously. In other words, "What should be taken into account when considering the continuity of teacher education is that it is the student and teacher as the recipients of education, not the givers of education, who are in subjective continuity and unity" (p. 356).

The structure of teacher education presented at the beginning of this paper is a system in which pre-training, recruitment, and in-service training are separated in stages. However, the connection between each of these stages has not been well considered, creating a reality shock for prospective teaching students. The educational practicum was positioned as an opportunity for teacher education designed to link these different stages, but during the COVID-19 pandemic, these opportunities have been difficult to acquire. Therefore, we consider it necessary to reconstruct a system that ensures continuity between and among the stages. In other words, another phase between pre-service and in-service teacher education should be created, as well as opportunities for

universities, schools, parents, and educational administration to work together to ensure the competence of in-service teachers.

The future of using ICT devices in Japan

Finally, we would like to consider the future of using ICT devices in Japan. In a survey conducted by the MEXT (2020) in April 2020 on home learning during extra school vacations, 1) 24% of students used TV broadcasting for learning, 2) 10% used class videos created independently by boards of education, 3) 29% used other digital textbooks or digital teaching materials, and 4) only 5% used simultaneous interactive learning materials for online instruction. This circumstance led to a nationwide "delay" in online instruction in school education through various media at the time.

However, a survey conducted in June of the same year by the Ministry of Education, Culture, Sports, Science and Technology showed that the percentages in these categories quickly increased, to 1) 38%, 2) 26%, 3) 40%, and 4) 15%. The most recent similar survey, conducted in September 2021 in response to the nationwide extension of summer vacation, showed 1) 7.2%, 2) 17.8%, 3) 30.5%, and 4) 31.2%, clearly indicating the widespread use of ICT for instruction. In particular, the percentage of simultaneous interactive online instruction has increased significantly. As a result, the percentage of "home study using textbooks and paper materials" decreased from 100% in the two surveys conducted in 2020 to 68.8% in September 2021.

With the introduction of a compulsory course on the use of ICT devices, the number of practical experiences using ICT will increase in the future. Prospective teachers improve their teaching skills by gaining experience in using ICT devices in mock lesson and teaching practice conducted at universities (Morishita et al., 2018; Terashima et al., 2016). The paper also points out that students' anxiety about operating the devices is a disincentive (cf. Morisihita et al., 2018).

Compared to the past, students should have many more opportunities to use digital devices in their daily lives. But, students' anxiety about operating the devices is a disincentive for using devices. The quality of their use in educational activities is considered to be completely different. Practical experience may not mean actual use experience. In addition to gaining experience, we need to consider the training of teachers while considering what uses ICT devices have.

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All-Japan International Online Education Platform: The Case of the JV-Campus

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ABSTRACT

Scheduled for launch in March 2022, JV-Campus is a new all-Japan international online education platform commissioned by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan in April 2021 as part of the Top Global University Project in the new normal. As a countermeasure to situations such as the COVID-19 pandemic which severely impacted the physical mobility of people resulting in the drastic decrease in both inbound and outbound student numbers, the JV-Campus project was conceptualized by MEXT with its headquarters at the University of Tsukuba in May 2021. As its vision statement, JV-Campus aims to "evolve learners and organizations, by weaving and circulating wisdom together". Hence, we are constructing a full-spec MOOC using the Moodle LMS, and we will offer two services, namely (1) Individual Box for each institution offering educational contents that are self-managed by each institution, and (2) Strategic Package Box offering package contents to institutions for use in their educational programs. We launched a pilot service on March 10, 2022. As of April 2022, 39 Japanese institutions open the Individual Box, while 71 institutions are offering contents in the study in Japan Special Box. We also welcome participation from overseas institutions.

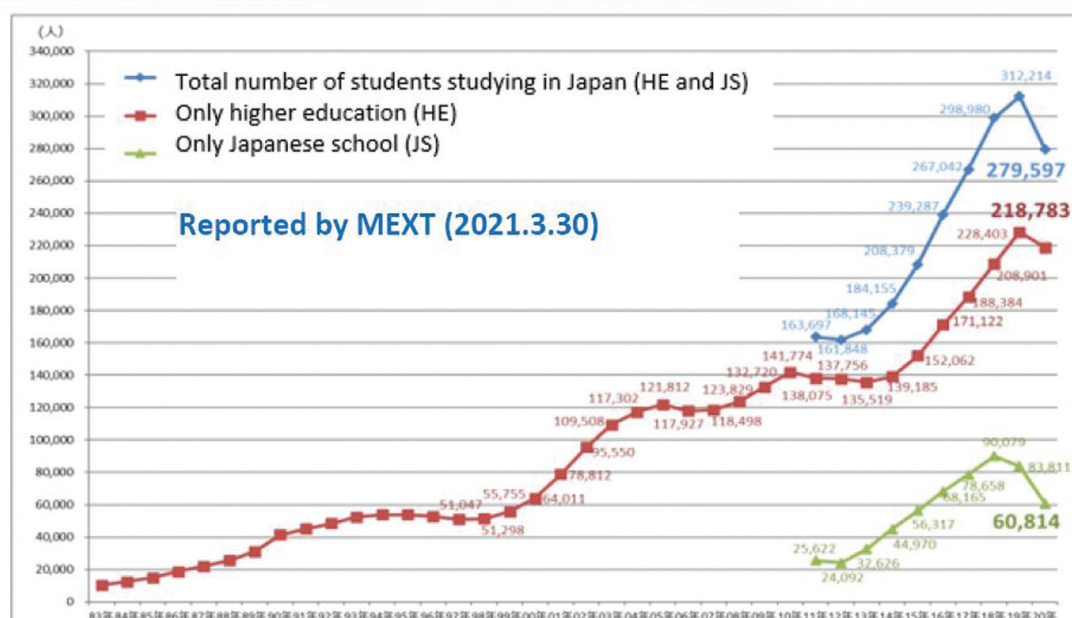**Keywords**: international project, JV-Campus, interdisciplinary education

Introduction

The COVID-19 pandemic impacted the physical mobility all around the globe. This also included students' mobility in Japan. As shown in Figure 1, both inbound and outbound numbers of students dramatically decreased after the emergence of COVID-19. Under such conditions, the Ministry of Education, Culture, Sports, Science, and Technology (MEXT) created a new project in April 2021 called "Japan Virtual Campus (JV-Campus)", which is an online education platform to support or complement our international educational activities.

The number of inbound students to Japan

Reported by MEXT (2021.3.30)

The number of outbound students from Japan
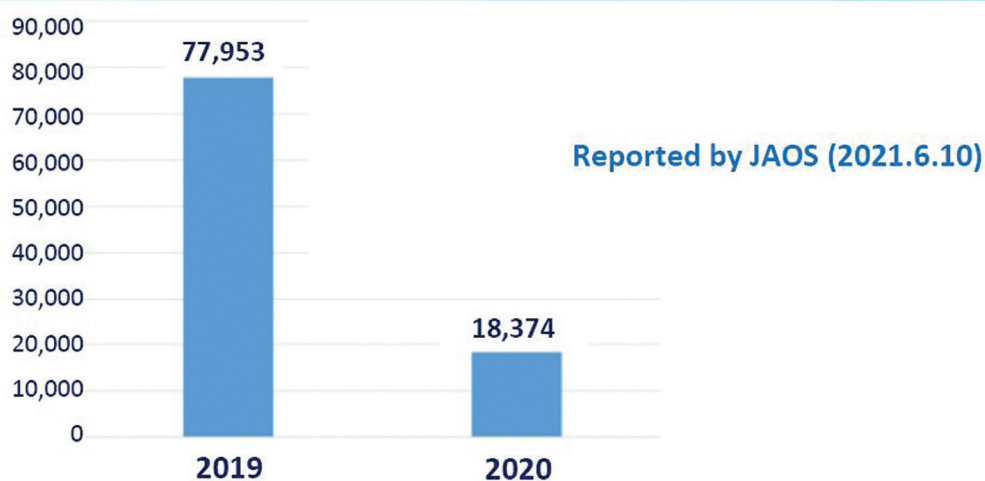

Reported by JAOS (2021.6.10)

Figure 1. Inbound and outbound students from Japan.[2,3]

JV-Campus is a main project in Japan Forum for Internationalization of Universities (JFIU), which was established on September 2021 as the consortium of Japanese universities with the goal of creating an environment for strengthening cooperation in, and horizontal development of, diverse achievements among a group of universities leading internationalization, as well as further strengthening the international compatibility and competitiveness of higher education toward new normal era.[1] The activity of JFIU is mainly supported by a top global university project offered by MEXT.

At present, many Japanese universities and institutions need online education platform, both for using the online education platform in their curriculum, as well as for offering the educational content to other universities (Figure 2A). In such situation, the University of Tsukuba

Figure 2. JV-Campus project. (A) Needs and (B). Proposed scheme by University of Tsukuba).

applied for the project with our previous success in online education systems such as Course Jukebox (Course Jukebox (CJ) is a system where the University of Tsukuba and oversea strategic partner universities provide and share lessons and courses.)[4] and All Japan e-learning cloud for cancer professional multidiscipline,[5] and the proposal shown in Figure 2B was approved in May 2021.

Expectations of the Program

To establish JV-Campus, we first conducted the questionnaire survey and online interviews to grasp the needs on JV-Campus from August 2021 to September 2022 (Figure 3) and found high needs in both contents offering and using in Japanese universities, particularly, correspondence of the contents offering and using in liberal arts, language education, license qualification education, data science education. It is expected that JV-Campus will play a role to link the offering and using. Also, many Japanese universities expect the online education platform to contribute to inbound and outbound students, such that JV-Campus can be a portal of Japanese higher education for both domestic and overseas users.

Proposed Structure

As business, the core value proposition of JV-Campus is the participation of many Japanese institutions in single initiative of MEXT. There, the University of Tsukuba will offer the value of the new online education together with other
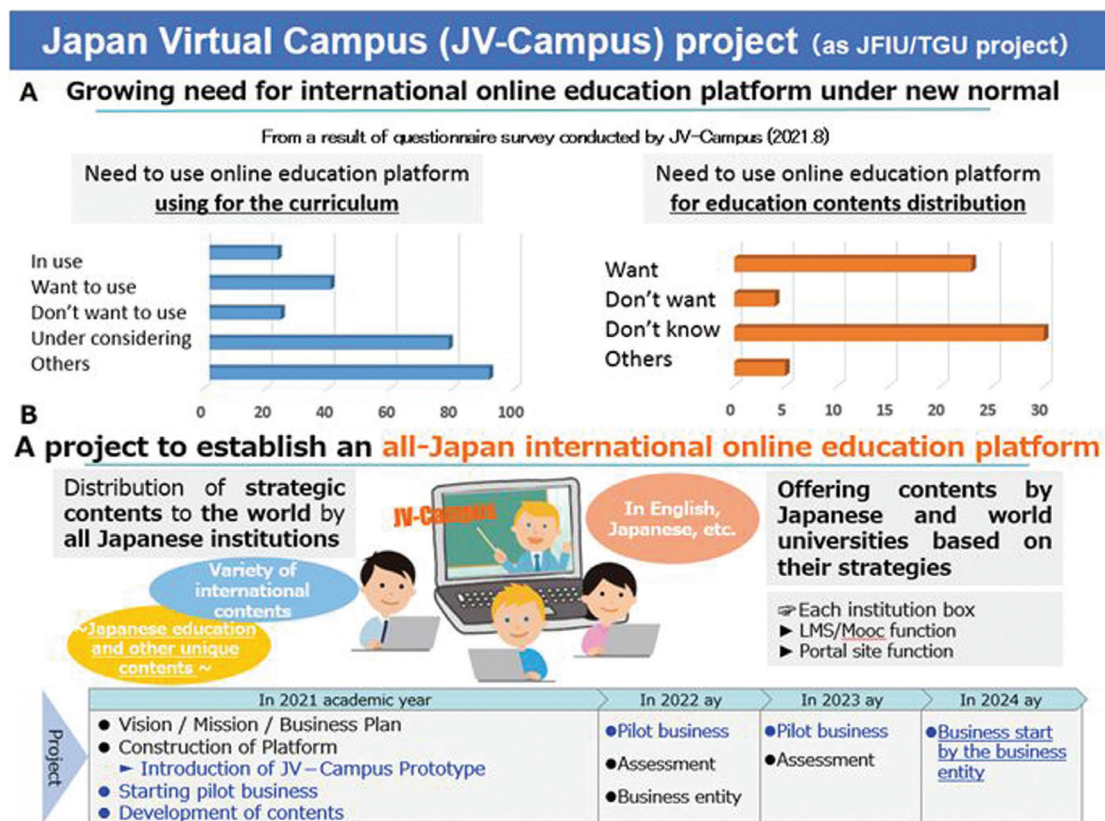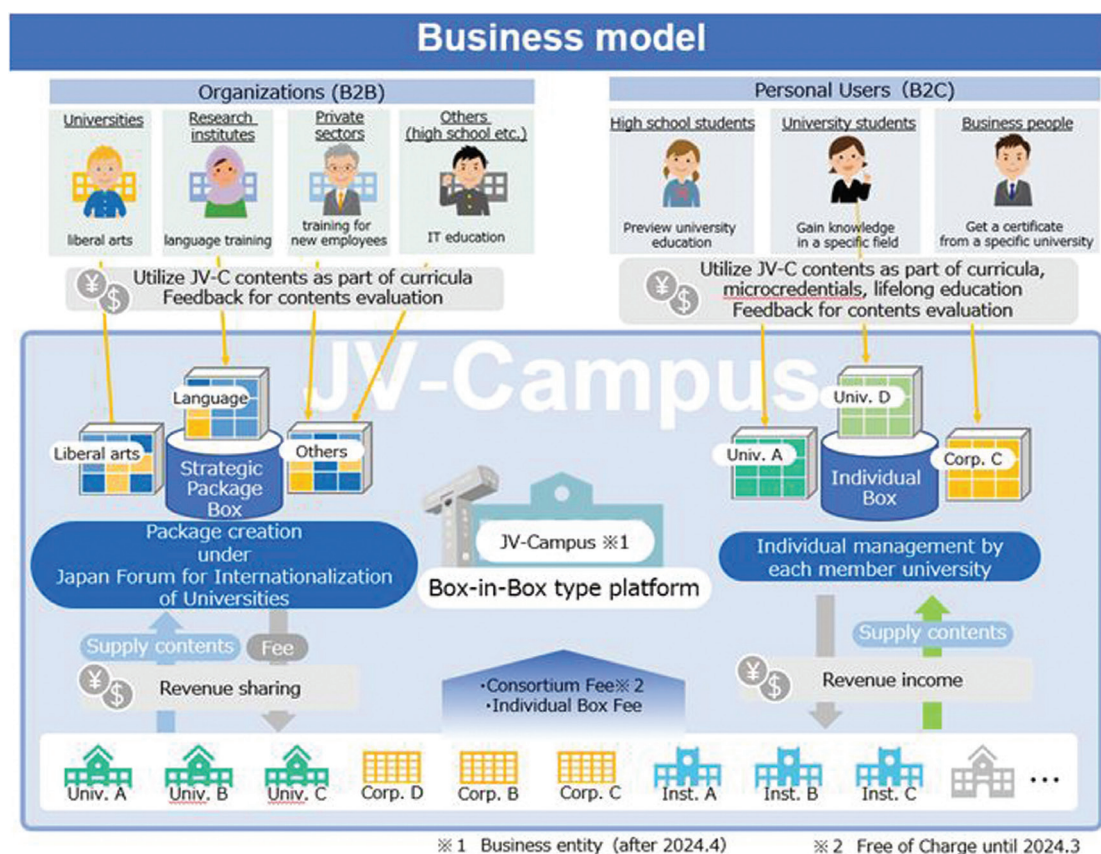
120

Figure 3. Needs assessment.

Figure 4. Proposed business model

Japanese universities. Hence, we set the vision of JV-Campus as following: JV-Campus will involve learners and organizations by weaving and circulating wisdom together. We also set the two missions of JV-Campus: (i) JV-Campus will empower each institution by enabling them to create, share, and utilize courseware packages that will support them in achieving their strategic objectives, and (ii) JV-Campus will empower you by offering a unique platform for learning and creating courses.

Next, we set the business model scheme to achieve our vison and mission (Figure 3). In this scheme, first, each institution needs to join in JV-Campus. Then JV-Campus will offer two main services to each institution. One is Individual Box, where we offer the LMS/MOOC system constructed by the Moodle[6] to each institution. Each can offer its unique contents according to the education management strategy of the institution, and can deliver the contents to variety of users. The second service is Strategic Package Box, which is a quite unique service from JV-Campus. There, we create educational content packages together with members of JFIU and offer the packages to the user institutions with JV-Campus brand. We will create this strategic package box on needs base. Our core value proposition enables this service, which is hardly found in other worldwide online education platforms such as COUSERA[7] and edeX.[8]

As first case of Strategic Package box, we targeted Japanese language education to overseas students. Now, it is under construction with the initiative of Tokyo University of Foreign Studies, a JFIU managing member.

In addition, we offer the special boxes corresponding to the emerging needs. For example, we now have a special box, Study in Japan Special Box, to support overseas students who cannot come to Japan due to COVID-19 pandemic. There, JV-Campus offers 250 contents provided by 71 Japanese institutions (as of April 13, 2022). The students can enjoy the study contents related to "Japan and Japanese Universities," "Special courses from Japanese universities," "Communication program," and

Figure 5. JV-Campus top page; https://www.jv-campus.org/en/.

"Messages from students in Japan". Another example is to advertise university fair to recruit students. Osaka University, a JFIU managing member, organized All-Japan university fair in March 2022, and we supported the advertisement to show the banner on the JV-Campus top page.

For content providers, we offer two options to utilize JV-Campus. One is to use this platform as a MOOC/LMS system, and the other is to use just portal site function. Many institutions have established their own MOOC/LMS in their campus and may not need to offer online education contents. Such institutions can use JV-Campus as the portal site showing only introductive information and web links to their own MOOC/LMS, and offer the contents from their websites. We believe for even such institutions our portal service enhances the visibility and accessibility to their contents.

Pilot Business Start on March 10, 2022

We launched Individual Box service on March 10, 2022. As of April 13, 2022 (Figure 4), 39 Japanese institutions opened the boxes and gradually started to offer content (https://www.jv-campus.org/en/).

Next Steps

We expect corporations and overseas institutions to join in JV-Campus to offer online education contents, and we will start the recruitment this year. We also seek the opportunity to collaborate with other online education platforms such as J-Mooc.[9] The

regulations to participate JV-Campus are shown at the bottom of JV-Campus top page (https://www.jv-campus.org/en/). Your participation and collaboration is highly welcomed.

Notes

1. Japan Forum for Internationalization of Universities (JFIU); https://www.jfiu.jp/en/
2. MEXT, "「外国人留学生在籍状況調査」及び「日本人の海外留学者数」等について"; chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/viewer.html?pdfurl=https%3A%2F%2Fwww.mext.go.jp%2Fcontent%2F20220330_mxt_gakushi02-1412692-01.pdf&clen=644337&chunk=true
3. JAOS, "日本人留学生数は前年24%とコロナ影響により激減。業界団体JAOSは留学支援指針を策定し、潜在留学層を支援。"; chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/viewer.html?pdfurl=https://www.jaos.or.jp/wp-content/uploads/2021/06/2021JAOS/E7/95/99/E5/AD/A6/E7/94/9F/E7/B5/B1/E8/A8/88/E8/AA/BF/E6/9F/BB/E3/81/A8/E7/95/99/E5/AD/A6/E6/94/AF/E6/8F/B4/E6/8C/87/E9/87/9D/E3/83/AA/E3/83/AA/E3/83/BC/E3/82/B9210604.pdf&chunk=true
4. Course Jukebox; https://cj.tsukuba.ac.jp/
5. All Japan e-learning cloud for cancer professional multidiscipline; http://ganpro-z.jp/e-learning.shtml
6. Moodle; https://moodle.org/?lang=ja
7. COURSERA; https://www.coursera.org/
8. edeX; https://www.edx.org/
9. J-Mooc; https://www.jmooc.jp/