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Ideas and challenges of the online classes under the COVID-19 pandemic

Asia & ASEAN Center for Educational Research
Faculty of Education, Chiba University

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CHIBA UNIVERSITY

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Contents

Foreword

Our lives have completely changed under the COVID-19 Pandemic which started in 2019. There have also been many changes in in university education. Admission to university campuses has been restricted under these circumstances. Therefore, University classes were forced to change from face-to-face style to online classes. This rapid change in class styles has caused many challenges over the past two years.

Those circumstances are likely to continue for several years. Therefore, we need to set up a new education style to adapt to the new era, the so-called "the post corona world." A record of those changes and difficulties will be helpful to look back on and evaluate in the future.

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Record of online University classes performed under the COVID-19 Pandemic at Chiba University

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In this report, typical systems and styles of online classes carried out in this period were collected, and then their characteristics and problems were analyzed.

I. Preparation of online classes before the Pandemic in Chiba University.

In 2019, Chiba University started a new education policy, known as ENGINE. This policy plan is to promote overseas programs to all students at Chiba University. To realize this plan, many classes needed to move to the online style to increase accessibility. Therefore, students would be able to join the classes even from abroad. However, online live-style classes use a lot of data capacity for internet transmission. At that point, only these online classes were planned. Therefore, internet capacity was insufficient for all the university students to access it at the same time.

At the beginning of the new semester of 2020, Chiba University shut down the campus, and every face-to-face class had to be changed to an online class. Because of the Internet capacity, online live-style courses were prohibited by the University Educational board. At the same time, the Zoom meeting application had some security issues, and the board also prohibited its usage. Therefore, there were three platforms, "Moodle, Microsoft teams, and G-suite," for online classes by the faculty. Many professors selected the Moodle system because Moodle was introduced earlier than the other two applications, so they were familiar with it.

Anyway, there were many difficulties in carrying out the classes, especially during the first semester.

II. Online teaching style

All the classes were moved on online and restarted in May 2020. The University Educational Board asked the professors to prepare online courses with smaller data sizes because both the University and students had a limited total data traffic capacity. There were four different types of on-demand classes, including text-only, audio, text slides and voice explanation, and video style.

The text-only style just shows slides, and students read them. The audio-style only heard provides a voice explanation. The slide presentation-style shows slides with voice

explanation as same as in the online science meeting. The video style consists of a lecture shown on the monitor with an explanation of the topics. There were also eclectic on-demand classes.

III. Teaching materials used for online classes

Most of the teaching materials used for the on-demand classes were similar to those used in the usual classes. The lecturers used original documents, textbooks, references such as newspapers and websites, PowerPoint slides, and movies.

Movies used for the on-demand classes included original ones and pre-created ones, such as YouTube.

However, most of the teaching materials were newly created for the on-demand classes,

IV. Advantages of online classes

The good point of doing classes online is the freedom of the class schedule after finishing the preparation for the lectures. In addition, after the classes changed from on-site to on-demand, lecturers only needed a minor modification of teaching materials each year.

These merits were also observed by students. Students can join the classes based on their schedules and can join the class anywhere they want. They can listen to the lectures repeatedly in order to understand them clearly.

V. Problems of online classes

As problems of performing online class systems and platforms, the poor internet environment in Japan was revealed. Internet costs were very expensive compared to other countries, and some students did not have their own laptops. They shared a PC with their family, so there were some limitations to using it. Also, most of us were not so familiar with the usage of the systems for online classes. Therefore, the situation caused some problems of usage and confusion during the classes.

Because of the change, all students accessed the University's online system for joining the classes simultaneously. The small capacity of the server system did not work well, so many students were unable to join the classes. After a while, the students got used to the situation and then adjusted their study style to the environment. They intentionally diversified their timing of taking classes. After their adaptation to the environment, the frequency of internet communication failures was reduced.

VI. Problems related to students' study performance

Students were able to listen to the classes several times until they could understand the contents. However, the explanation and instructions by the lecturers were insufficient in several classes.

In those cases, students could not understand the course contents, which decreased their motivation to study. Many lecturers gave too many assignments in the classes. This happened because of their unfamiliarity with online classes. Lectures routinely ask several questions to realize the critical point of the contents, and in the online class, they could not ask those directly to the attendants, so instead, they gave them as assignments. Then students had so many tasks, and they needed to study hard by themselves to answer those questions. Many students complained that they did not have enough time to sleep because of the assignments.

On the other hand, students could not communicate with lecturers and their classmates, especially first-year students, because they did not have a chance to meet any of them and did not know them well. This condition not only affected their motivation to study but also their mental health. Some students come from outside Chiba city and live in a dormitory or rental apartments alone. In those cases, they could not meet any people under the restrictions on going out caused by the Pandemic. In particular, their loss of communication with classmates and lecturers still remains. And it has affected their relatively low motivation to study and mental troubles.

VII. Conclusions

We have experienced several difficulties during these two years. Through this situation, we learned and developed methods of conducting online classes. Both advantages and disadvantages or suitable and unfavorable usage of the usage of online courses gradually become revealed. Based on these experiences, we should collaborate on new styles of education for the post-COVID-19.

Review of ideas and challenges for online classes by the TWINCLE consortium universities in East and South-East Asia

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Abstract

To share the information on online classes, the TWINCLE consortium universities held an online meeting in February 2021. In the meeting, they shared information on online classes based on their practices in 2020. They shared following information; (1) Various types of online class were conducted (2) Online international programs were also conducted (3) Teacher education on online was also focused. Problems on online classes they noticed in their activities were also shared. These shared information and problems would be useful for the TWINCLE consortium universities to work together for developing model classes which are applicable to the situation under the COVID-19 pandemic.

Main topics

1. Introduction

Under the COVID-19 pandemic since 2020, universities are shifting their forms of class from face-to-face to online-based. To share the information on online classes which are practiced and developed by each university of the TWINCLE consortium [1)], an online meeting titled "University classes taught online -new challenge and good practice under the COVID-19 pandemic" was held on 13th February 2021[2)]. In the meeting, each university introduced their practiced and developed online classes[3)-17)]. Some universities also introduced survey data on online classes. In addition, problems on online classes they noticed in their activities were also shared. In this study, I reviewed the information and problems on online classes which were introduced in the meeting.

2. Participants

Participants in the meeting are given in Table 1. It consists of 15 universities of the TWINCLE consortium in East and South-East Asia.

3.Reports and suggestions in the meeting

3-1. Activities conducted

Various types and styles of the online class were adopted by Chiba University[3)] as follows; (1) The types are "Only online" and "Mix online and face-to-face" (2) The styles are "On-demand", "Live" and "Mix On-demand and Live" (3) The teaching materials are "Original print", "Textbook", "References", "PPT", "Original movie", and "Movie on website". To select optimum online types and styles, Chulalongkorn

University[10] considered class size (large, moderate, small) and class style (lecture, experiment). Regarding experiment class for preservice science teaching, Kasetsart University[11] adopted online system, i.e., combined “face-to-face micro-teaching” and “Online reflection”.

Online collaboration in the class was promoted by Bogor Agricultural University[5] especially. They conducted online collaboration in “Human Compute Interaction” class by adopting various online tools, e.g., Moodle-powered learning management system, Google Sites, Zoom, Google Meet, WhatsApp, LINE, Mural, Figma, and Maze Design.

International programs were also conducted by online. Bandung Institute of Technology[4] conducted “International virtual course on Oceanology focusing on SDGs”. Udayana University[6] conducted a virtual international program.

Teacher education was also focused. Gadjah Mada University[7] conducted guidances on online teaching. Chiang Mai University[9] conducted training program about Chemical education, STEM education, Business education and Art education. Mahidol University[13] conducted workshop to create animation and about digital learning. Royal University of Phnom Phen[15] conducted teacher updating program. National Taiwan Normal University[16] instructed teachers in instructional media in the course of curriculum development.

Some original online learning management system and teaching materials were developed. Gadjah Mada University[7] developed learning management systems, “Simaseter” and “eLOK”. Indonesia University of Education[8] developed “MSTR EPMIPA UPI” for pre-service teacher training course to increase awareness on ESD.

Surveys on online class were also conducted. King Mongkut University of Technology Thonburi[12] surveyed students’ perceptions of the online leading. Results are as follows; (1) Students cannot concentrate on online learning in a long period of time (Learning duration should be in 0.5 – 1.0 hr) (2) Students prefer to self-study from pre-recorded video clip, then entering to the live-stream class for discussion (3) Students’ perceptions and feedbacks of the designed learning activities are valuable for teachers to improve their online course. Mahidol University[13] surveyed educational aspect in Thailand. Results are as follows; (1) Channels for online learning used in Thailand are Digital TV, Satellite TV, Mobile application, YouTube, Website (2) Teenagers in Thailand preferred online learning method. University of San Carlos[14] surveyed teachers’ conceptions of student workload in the teaching of science during the COVID-19 pandemic. Results are as follows; (1) Teachers appear to treat the change in modality as a technical change (2) Their fundamental conception and understanding of student workload did not change from their pre-pandemic stance (3) This results to a very heavy curricular requirement on the part of the students.

3-2. Tools used

Various tools for online class were used. As mentioned in the "3-1. Activities conducted", Bogor Agricultural University[5] adopted various tools especially. Chulalongkorn University[10] also adopted various tools by considering class size and type, e.g., Blackboard, My CourseVille, MS Teams, Google Meet, Facebook Live, Echo360, YouTube VDO.

As also mentioned in the "3-1. Activities conducted", some original tools were developed by Gadjah Mada University[7] and Indonesia University of Education[8].

3-3. Problems occurred

About problems on classes, Chiba University[3] reported in detail as follows; (1) About system and platform: Internet environment, Cost for Internet, Failure of Internet communication, Security of Internet (2) For teacher: Preparation of teaching materials, Class organization, Reflection of the class, Evaluation of students' achievement (3) For student: Difficulty to understand the subject, Too many assignment, Schedule control, Motivation, Difficulty to communicate with mentor and classmates, Mental health.

About problems on international programs, Udayana University[6] reported in detail as follows; (1) About Internet and time: Unable connection, Cost, Different platform among countries, Different time zone among countries, Class organization, No video (2) About lecture: Preparation of teaching materials, Understanding of subject, Practical activity, Too many assignments, Less of student response.

About problems on teachers, VNU University of Education, Hanoi[17] reported as follows; Digital illiteracy, Obsolete technology, Rejection to change, Confusing initial step.

3-4. Suggestions

For improvement on classes, Chiba University[3] suggested as follows; Prepare well organized direction of learning with chat, Adopt TV or live system, Feedback to the questions and submissions from students, Prepare interactive session through Internet.

For improvement on international programs, Udayana University[6] suggested as follows; (1) About Facility: Improve Internet quality, Class organization, More class duration, Less number students in one class (2) about Lecture: Good interactive teaching material, Use many platforms, More discussion and practical, Clear direction before the class, Make video, Students' presentation, Give feedback.

For improvement on teachers, VNU University of Education, Hanoi[17] suggested as follows; Change how leaders think, Lead by example, Be open to feedback, Communicate the benefits of transformation.

4. Conclusion

In the meeting, the TWINCLE consortium universities could share useful information on online classes based on their practices in 2020 under COVID-19 pandemic.

Universities are facing common problems in situation where face-to-face class is restricted. For example, establishing a model of experimental class that incorporates online is an important subject. Establishing a model of international program on education that incorporates online is also an important subject. About these subjects, some participants introduced their activities. I hope and believe that the TWINCLE consortium universities would work together to develop some model classes and styles which are applicable to the COVID-19 pandemic.

Acknowledgments

I am grateful to all the participants in the meeting for their providing useful information and suggestions on online class.

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Table 1. Participants in the TWINCLE consortium meeting.

Sr. No.	Country	Name
1	Japan	Chiba University
2	Indonesia	Bandung Institute of Technology (ITB)
3	Indonesia	Bogor Agricultural University (IPB)
4	Indonesia	Udayana University (UNUD)
5	Indonesia	Gadjah Mada University (UGM)
6	Indonesia	Indonesia University of Education (UPI)
7	Thailand	Chiang Mai University
8	Thailand	Chulalongkorn University
9	Thailand	Kasetsart University
10	Thailand	King Mongkut University of Technology Thonburi
11	Thailand	Mahidol University
12	Philippine	University of San Carlos
13	Cambodia	Royal University of Phnom Phen
14	Taiwan	National Taiwan Normal University
15	Vietnam	VNU University of Education, Hanoi

Table 2. Reports and suggestions on online classes by TWINCLE consortium universities

Sr. No.	Activities conducted	Tools used
1	Online class <Type of the class> ・Only online ・Mix online and Face-to-Face <Style of the class> ・On-demand (Text, Radio, Movie) ・Live ・Mix On-demand and Live <Type of the teaching material> ・Original print ・Textbook ・References (website etc.) ・PPT ・Original movie ・Movie on website	・Moodle ・MS Teams ・Zoom ・G-Suit
2	International virtual course on Oceanology focusing on SDGs	・Zoom
3	Online class in "Human Computer Interaction" (adopted Online panel discussion, Reimage experience, Brainstorming etc.)	・Moodle-powered learning management system ・Google Sites ・Zoom ・Google Meet ・WhatsApp ・LINE ・Mural ・Figma ・Maze Design
4	Virtual international program	
5	・Developed original learning anagement system (Simaster, eLOK) ・Developed COVID-19 protocols for research activities ・Conducted guidances for online	<On-demand> ・Simaster (original) ・eLOK (original) ・Elisa

	teaching ・Conducted ceremonies by online	・dan <Live> ・Google Meet ・Cisco ・Webex
6	Developed online teaching material for pre-service teacher training course to increase awareness on ESD	・YouTube (MSTR EPMIPA UPI)
7	Conducted training programs for all academic staff about ・Chemical education ・STEM education ・Business education ・Art education	・Zoom ・MS Teams ・Google Meet ・Google Classroom
8	Online class Selected optimum tools based on class size (large, moderate, small) and type (lecture, experiment)	<On-demand> ・Blackboard ・My CourseVille ・MS Teams <Live> ・MS Teams ・Google Meet ・Facebook Live ・Echo360 ・YouTube VDO
9	Online class for preservice science teaching ・Face-to-Face micro-teaching + Online reflection ・Ready for online and face-to-face learning (Two versions of lesson plan) ・Digital support system	・Video ・Application
10	Surveyed students' perceptions of the online learning <Results of survey> ・Students cannot concentrate on online learning in a long period of time. (Learning duration should be in 0.5 – 1.0 hr)	

	・Students prefer to self-study from pre-recorded video clip ・Students' perceptions and feedbacks are valuable for teachers to improve their online course.	
11	・Conducted workshop for teacher to create animation ・Conducted education for teacher on digital learning ・Established connection among teachers and collaborative events ・Surveyed of educational aspects in Thailand <Results of survey> ・Channels for online learning used in Thailand are Digital TV, Satellite TV, Mobile application, YouTube, Website ・Teenagers in Thailand preferred online learning method	
12	Surveyed teachers' conceptions of student workload in the teaching of science during the COVID19 pandemic <Results of survey> ・Teachers appear to treat the change in modality as a "technical" change. ・Their fundamental conception and understanding of student workload did not change from their pre-pandemic stance. ・This results to a very "heavy" urricular requirement on the part of the students.	
13	Teacher updating program	
14	Instructed teachers in instructional media in the course of curriculum development	・Power Director ・PPT ・Google Survey
15	Proposal of points for introducing digital tools into class successfully	

Table 2. (Continued)

Sr. No.	Problems occurred	Suggestions for improvement
1	<System and Platform> ・Internet environment ・Cost for internet ・Failure of Internet communication ・Security of internet <Teacher> ・Preparation of teaching materials ・Class organization ・Reflection of the class ・Evaluation of students' achievement <Student> ・Difficulty to understand the subject ・Too many assignment ・Schedule control ・Motivation ・Difficulty to communicate with mentor and classmates ・Mental health	・Prepare well organized direction of learning with chart ・Adopt TV or live system ・Feedback to the questions and submissions from students ・Prepare interactive session through Internet
2	・Some countries could not access Google classroom ・Time zone difference ・Participants were decreased each time	
3		
4	<Internet and Time> ・Unstable connection ・Cost ・Different platform among countries ・Different time zone among countries	<Facility> ・Improve Internet quality ・Class organization ・More class duration ・Less number students in one class <Lecture> ・Good interactive teaching material

	・Class organization ・No video (Not interactive) <Lecture> ・Preparation of teaching materials ・Understanding of subject ・Practical activity ・Too many assignment ・Less of student response	・Use many platform ・More discussion and practical ・Clear direction before the class ・Make video ・Students presentation ・Give feedback
5		
6		
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8		
9		
10		
11		
12		
13		
14	Low performance in using ICT to support instruction	・Teacher education and qualification
15	・Digital illiteracy ・Obsolete technology ・Rejection to change ・Confusing initial setup	・Change how leaders think ・Lead by example ・Be open to feedback ・Communicate the benefits of transformation

Inclusive Cities 2020 : Interdisciplinary Community Based Learning

Chainarong Jarupongputtana[1]

Abstract

Inclusive Cities 2020 : Interdisciplinary Community Based Learning The Child and Youth Media Institute, in collaboration with a regional network of educational institutions creates the creation of a conceptual space for youth to express their needs and design a public space in active learning. Specifically, the need to contribute to a policy proposal for urban development based on the Inclusive Citizenship. The objectives of this research to build cooperation among youth networks for urban development by using creative learning as Media Information and Digital Literacy The sample group for the research were team of high school students conducted field research in a local village under the mentorship of undergraduate students. Their study explored dimensions of education, communication, and landscape architecture for conservation and urban development through the use of digital media, including an online platform for sharing ideas and skills. As a result, new policy was proposed to the hosting community. The findings show the following results. Students shared data, ideas and skills via an online platform. Students work together on the basis of community communication using the concept of Media Information and Digital Literacy. This is a process that was created by the community and the youth.

Keyword : Project Based Learning , Media Information and Digital literacy

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Main topics & Acknowledgments

Learning Through Community-based Project . (Project Based Learning) (William N Bender:2012) Planning for PBL Essential consisted of the following steps: A Project Anchor A Driving Question /Student Choice and Student Voice /Specific process for Investigation and Research /Student Inquiry and Innovation / Collaboration and Teamwork /Opportunities for Reflection /Feedback and Revision /Public Presentation of the Project Result which had the sequence of steps in relation to the creation of the learning process in the learners by Active Learning but because of the COVID – 19 situation causing the limitation which is the important problem in which the teacher-students designed the field-trip to adjust the activities into Online Platform according to the level of situation because in each area there were differences in the epidemic severity .

From the learning steps by using project based activities, there were many steps that used brain storming and discussion group such as designating the issue, driving by questions choosing issue from the members or using feedback information and sharing opinion which could be done on line but still have limitation about the interactions which changed from real experience field trips to the virtual space making the communication form changed from face to face into Digital Platform both between the learners and the teachers , the learners and the community or civil society which was the important issue making the learners use thoughts and created alternative choices with the field-trip that was changed.

Figure 1 Fieldwork with the Social Distancing in schools and communities

“Interdisciplinary Community Based Learning ” The operations including the integration of MIDL Process Concept for Inclusive City (Media Information Digital Literacy) through the courses of Faculty of Education Chiang Mai University namely Course 100222 : Global Education for Lifelong Learning, Course 071415 ; Globe and Geo-infomation in order to combine the Learning Process from Teacher-Students to High School Students in the area of Chiang Mai province including: CMU Demonstration School, Wachirawit School Chiang Mai, Regina Coeli College Chiang Mai, Montfort College Chiang Mai and The Prince Royal's College. There were the operation through workshop by using the issue of sustainable development and bring knowledge to use in the nearby community area around the schools which lead to the creation of ideas and innovative proposal model in order to propose the policy to Local Government Unit and received the co-operations from the Faculty of Education Chiang Mai University, Faculty of Information and Communication Maejo University, Faculty of Architecture and Environmental Design Maejo University who joined together in using nature of science in each Faculty to fulfill the important concept of communication and digital learning process and the real world application respectively, through the process of multidisciplinary mentoring including teachers in secondary schools , university lecturers, educational institutes both in the level of schools and universities, private organizations, local government organizations and related government agencies.

Figure 2 Student teachers design food map on the website for learning process with learners through an online Platform

Because of the COVID -19 situation causing the learners to adjust communication and learning model that were creating new media to support the project and the media from the students who produced them to present their own work including documentary short films, architectural models and the policy proposal for the local government organizations in which each school created works according to team member potential and aptitude, there were publications via YouTube, Facebook, Instagram and twitter instead of the ordinary meeting through discussion in the normal situation.

Figure 3 Learner to produce media to communicate the stories of the community and school through an online platform.

Moreover, the students' connecting knowledge was applied from Service Learning. (Service Learning) Service Learning & Leadership : Academic Service-Learning .University of Nevada 2012 which is the important proactive learning strategies and created experiences in learning and teaching for both students and teachers to combine between experience learning and participation including. Academic body of knowledge, experiencing learning and creating civil society co-operation through the combination of realization and understanding creation in civic education process, volunteer and community participation, internship and field trip activity. Online communication model need to have preparation in the Data collecting, media recipient analysis and also building the understanding with the civil society and the changing of field trip data collecting because some communities may have limitations about the moving of people from other communities among the COVID Pandemic situation and to build understanding based on reasons with the communities.

The result of the operation were found that there were changes at the level of thinking, attitude, values up to the behavioral level that is children , youth or students who participated in the project , the observation and questioning process occurred which lead to concrete changes

Creating thinking systems and be sensitive to government development which affects the lives of the people. There were the group gathering to find the proposal or the solving problems for examples: public spaces, noise pollution, traffic jam, air pollution and also garbage disposal- problems from the field trip of the students and youth to build the awareness of the real villager- needs. The learners had behaviors that lead to the civil

participation and emphasizing on the fairness in the society and had the voluntary mind in their nearby or far away situation from the community field study.

Youth had leadership development , the changes from the real life operation of the learners and the policy proposal design which connected the learners' identity to the real context which let them learn from the problems that truly occurred in the community , developed the media receiving and communicative process analytically making the learners the local level situation with real problems of the structure, creating the systematic thinking and holistic thinking in order to build the youth network and work together to make the change in the nearby school community. In the community field work, children and the youth happened to find new spaces and making new network groups connecting between the private schools, creating learning process from learning resources around the schools to combine in class academic principles with the applications in real- life world which causing teaching model and dimension in the university level through the service learning to connect knowledge to learners who are students and the areas of community cooperation., adjusting and integrated science in order to create new meanings for evaluation and measurement.

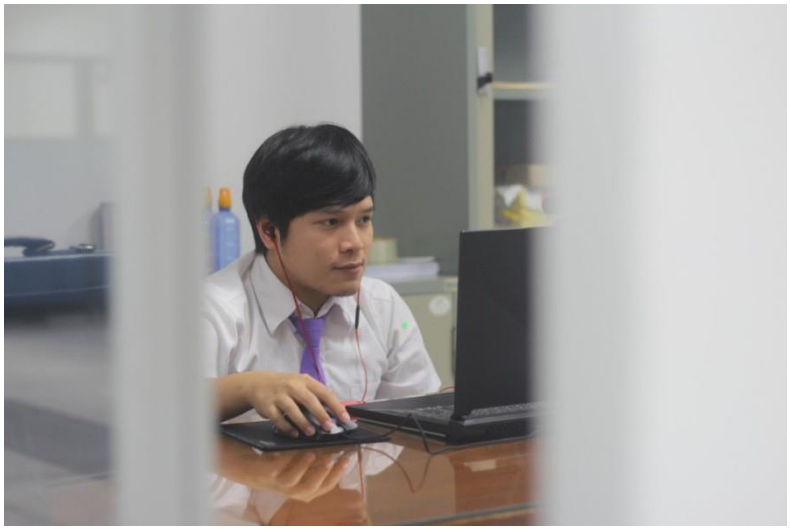

Figure 4 Student teachers communicate with learners online platform in Covid-19 pandemic

The creating process of the operation areas including communication area, learning area, interactive are. Students told the story about their potential and aptitude through short film project, creating cooperative learning through Pre-production /Production /Post-production connecting the experienced learning which using Media Creating Process for Children and Youth (2020) including Access: to find the data , to have roles as a good citizen , Analyze: to analyze the media roles to the perspective-presentations, City Area Identity, Create: design the media and send powerful and youth potential message, Action: present and had learning process together in the society, creating the areas of understanding from the participation of everyone in the community.

Students worked on the area to connect Data (Access) in the classes with the findings in the real context through the reflection of Citizenship Education which has main issue in Learning through Analysis to make the Communication (Create) through their perspective and power on and on in order to create communication between schools and surrounding communities which would lead to understanding and cooperation which would happen in the future from everybody ‘s perspective.

Other performance results that occurred beyond the goal or the expecting results were:students who experienced as the mentors summarized the experiences and skills to create the process of learning media contest for high student s in the North in the project called: New media Contest: Democracy and Equality in Globalization in the online contest activities : the 18th Chalk-box Opening “Lifelong Learning because Learning never ends” which received great attention from students and happened the network that created Media Information and Digital Literacy work in the future.

Result from the operation has led to the participation in sharing opinions from experiences in working with students in the Academic Seminar : “Smart Cities & Urban Development : Experiences from Upper Northern Region”

A team of high school students conducted a project on a fieldtrip with undergraduate mentors. The project explored dimensions of education, communication, and landscape architecture for conservation and urban development through media and policy proposals. Students shared data, ideas and skills via an online platform. COVID -19 Pandemic situation is the important problem which caused the learners to show their potential to use strength and weaknesses in adjustment to create new learning which corresponding to the situation and become the good opportunity to combine together the learning process between Higher Education , Basic Education and Civil Society.

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Students' Perceptions of an Online Learning: The Key Elements to Encompass Instructors for Designation of Online Course During the COVID-19 Pandemic

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Abstract

The COVID-19 is an unexpected educational disruptor that accelerated the pace of innovation in online teaching and learning during this time. Especially in terms of teaching science laboratories, instructors have to change to organize online classes based on circumstances and resources that are favorable to both teachers and students. Science teachers at both secondary and higher education face the challenges of teaching laboratories online for many reasons such as lacking the knowledge to design online teaching. In this chapter, the online laboratory learning unit on the topic of Planck's constant in physics was developed for 349 undergraduate students during the pandemic. The tools for evaluating the effectiveness of the learning unit in terms of students' achievement and students' perception of the learning unit are presented. The results from a laboratory report and a comprehensive quiz indicate that the majority of students passed analysing simple data and reporting with appropriate significant figures topics. However, some students have difficulties in analysing, evaluating and presenting data, analysing uncertainties, and interpreting the accuracy and precision of the final result, which require a deeper analytical thinking. The results from the perception survey show that the two main factors that help reinforcing the success of the online class are the teachers and the online teaching tool such as Kahoot. This could provide empirical information for teachers to design online laboratory courses during or even in the post-pandemic.

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INTRODUCTION

During this century, human society has faced disruption caused by a wide range of factors, including human beings, such as innovating instead of traditional innovations, especially scientific, communication technologies. or factors caused by the environment such as natural disasters, plagues, etc. This sudden change will affect human livelihoods both optimistically and badly. Since 2019, the world has faced a pandemic from the Coronavirus or COVID-19, one of the greatest pandemics in humanity. The pandemic has caused many people to be infected and die throughout the world. It also brings a great change in all dimensions of the global society. Especially, the education aspect has faced a dramatic shift from the COVID-19 pandemic, which has had a wide impact on students and teachers around the world. The COVID-19 pandemic has resulted in educational institutions being shut down and adapted to remote learning or distance education.

Before the pandemic, distance education was gradually widespread by taking advantage of the groundbreaking of communication technology for making teachers and students from a different place be connected online (Hanna, 2003; Moore & Anderson, 2007). However, the pandemic affects both students and teachers to be a new normal of education. Teachers in all disciplines at any level have been forced to suddenly adapt their teaching to be online for sustaining the learning of students in this unusual situation. It can be called the COVID-19 as an unexpected educational disruptor that accelerated the pace of innovation in online teaching and learning during this time.

Science in any branch such as physics, chemistry, biology, etc. is one of the most affected disciplines due to the pandemic especially in terms of laboratory teaching. Teaching science does not mean focusing on content knowledge in science, but also requires experimental practices to help students understand the scientific process of seeking scientific knowledge of scientists, as well as to practice using scientific instruments in a laboratory (Babinčáková & Bernard, 2020). The main challenge for science teachers at any level has faced is how to create an online course that can provide students' knowledge from both content knowledge and practical knowledge. Especially in terms of teaching science laboratories, instructors have to change to organize online classes based on circumstances and resources that are favorable to both teachers and students. Science teachers at both secondary and higher education face the challenges of teaching laboratory online for many reasons such as lacking the knowledge to design online teaching, lacking the ability to choose a variety of digital tools for supporting online teaching, and lacking tools and technology for remote teaching (Babinčáková & Bernard, 2020; Crucho, Avó, Diniz, & Gomes, 2020; Njoki, 2020; Okebukola et al., 2020; Soares, de Mello, da Silva, Machado, & Arbilla, 2020; Tigaa & Sonawane, 2020; Villanueva et al., 2020). These problems are critical for students' success in online learning. For succeeding in online teaching, teachers should be enthusiastic, creative, adaptive person in managing online learning from limited resources to lead students to the goal of learning (Anzovino et al., 2020; Dietrich et al., 2020; Peng, Barham, Hunnicutt, Li, & Moment, 2020).

Although the impact of the COVID-19 pandemic has caused students to experience some learning losses due to learning activities not being fully taken place (Turner, Hughes, & Presland, 2020). There are some findings that indicate that most students have a negative perception of online learning and prefer to learn face-to-face, however, there are some students who enjoy online learning because they can manage their learning based on their own pace (Blizak, Blizak, Bouchenak, & Yahiaoui, 2020; Hermanns, Schmidt, Glowinski, & Keller, 2020; Sunasee, 2020). So that, a big question for all teachers is "Is the designed course effective enough for promoting students' learning?" To evaluate the effectiveness of the course, not only focusing on the achievement's score from the formative and summative test, but students' perception of the developed course also provides key information to help the instructor improve the course to be better (Babinčáková & Bernard, 2020; Blizak et al., 2020; Cho, Kim, & Choi, 2017; Duangpummet, Chaiyen, & Chenprakhon, 2019; Kim-Godwin, Turrise, Lawson, & Scott, 2018; Krasnova & Ananjev, 2015).

In this chapter, the online laboratory learning unit on the topic of Planck's constant in physics is developed for undergraduate students during the pandemic. The tools for evaluating the effectiveness of the learning unit in terms of students' achievement and students' perception of the learning unit are presented. The results could provide empirical information for teachers to design online laboratory courses during or even in the post-pandemic.

ONLINE LABORATORY LEARNING UNIT DESCRIPTION AND IMPLEMENTATION

PHY192 General Laboratory II is a subject emphasising on the experimental skills and it is for the first year engineering and science students across the university. In this study, there were 349 students enrolling this course at the beginning of the academic semester.

Prior to the COVID-19 pandemic, this course was taught on-site where students came into the class, performed the hand-on experiment, took the measurement and analysed the data. The method of teaching was to emphasise on two learning objectives - developing the hand-on skill and the data analytical skill of the students. However, due to the COVID-19 pandemic, this prevented students from coming and gathering at the university. All of the experimental sessions must be converted to online. This affected the experimental subjects such as this one so significantly that it required the new pedagogy and the shift of the learning outcomes.

For the learning outcomes, instead of focusing the hand-on skills, we emphasised more on the understanding of the experimental process. For example, the procedural process of the experiment, together with the theoretical concepts of each procedural step were elaborated and exemplified to the students. To compensate for the decrease in the hand-on skills, the data analysis, evaluation and interpretation, such as reporting with appropriate significant figures, analysing uncertainties and the interpretation of the

accuracy and precision of the final result, were mainly focused.

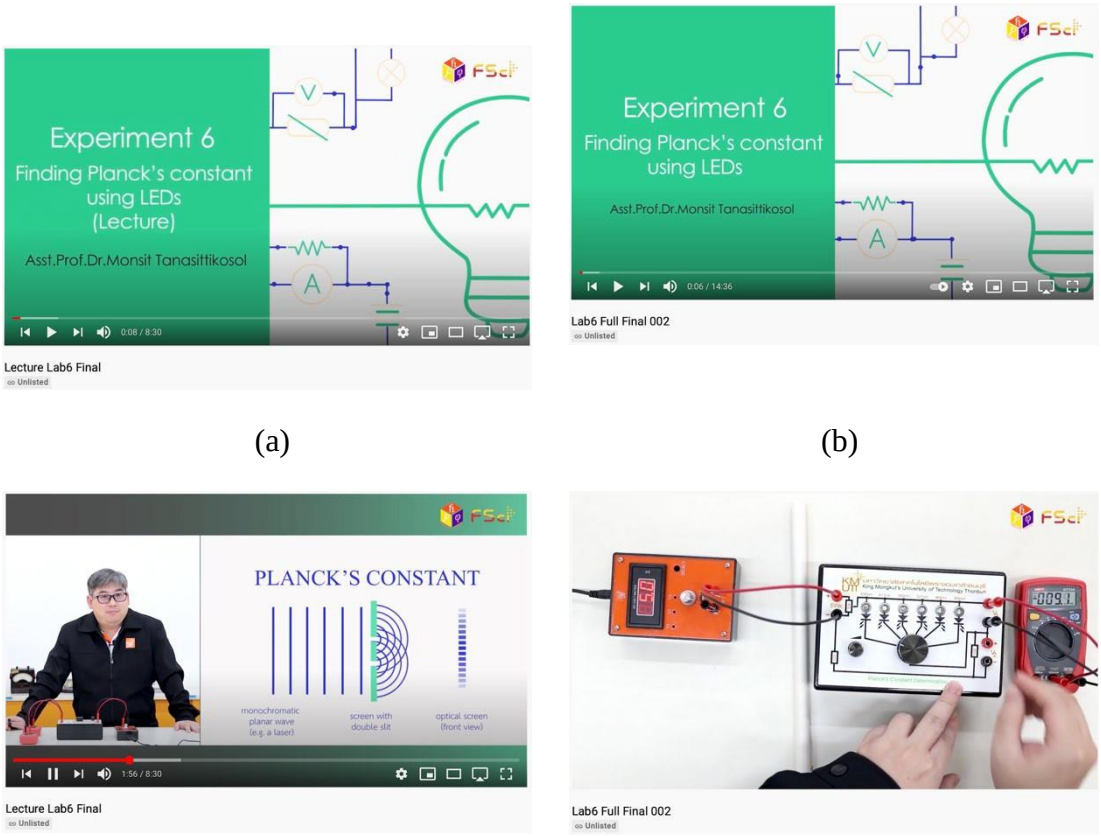
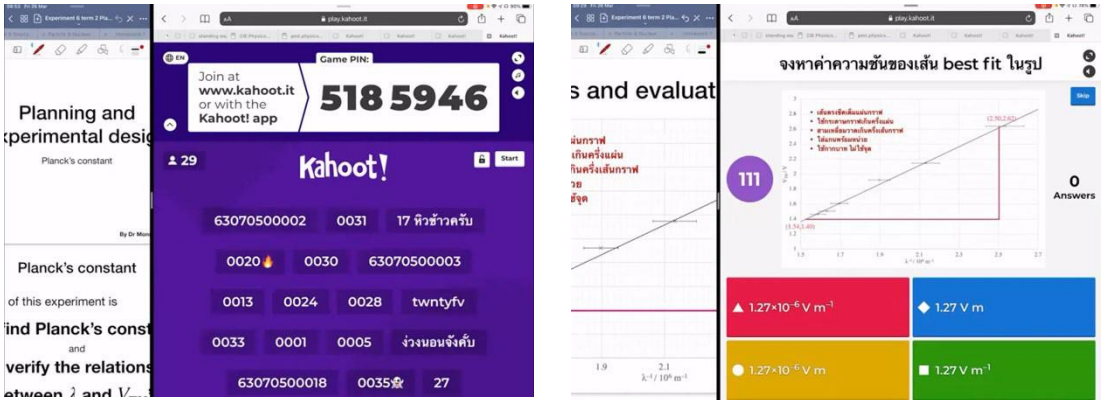


Figure 1. (a) The video gives details about the theoretical concept behind the experiment. (b) The video describes the experimental procedure. (c) This figure gives an example of how the theoretical concept is introduced. (d) An example of how the experimental procedure is described in the video.

To design the teaching pedagogy, two videos, one is the theoretical concept behind the experiment and the step-by-step procedure in the experiment, were created. This is shown in Figure 1 (a) to (d). The students were asked to watch these videos before coming to the online session. To ensure that the students watched them, there was a 15-min quiz at the beginning of each online session. Another problem that has been widely talked about was the method to probe the students' understanding during online class as most of the students hardly participated in the online activities. To encourage and probe students' understanding, Kahoot was used as a tool for this purpose as shown in Figure 2 (a) and (b). The slides and questions were put into the Kahoot presentation. There were two approaches to introduce the new concepts during the teaching. If the concepts were not too hard, the students first made an attempt to answer the questions, and then the

explanation was clearly discussed. When the answer was not their expected answer, the students were motivated to find out more about the correct answer. However, if the questions were hard and involved calculation, the clear explanation was first delivered and then followed by the questions. This method was good to check for the students' understanding. After each session, the students were asked to evaluate the teaching using Google Form and at the end of the semester there was a comprehensive quiz as one of the summative assessments.



(a) (b)

Figure 2. (a) Kahoot was used as a tool to introduce the new concepts and to probe students' understanding during the online session. (b) An example of using Kahoot as the formative assessment. In this case the students were asked to calculate the gradient of the line of best fit. Most of the students got the wrong answers on the first attempt. Afterwards the explanation was clearly given. This technique was good to stimulate students' curiosity.

ONLINE LABORATORY LEARNING UNIT EVALUATION AND DISCUSSION

1. STUDENTS' LEARNING ACHIEVEMENT

Students' learning achievement was evaluated from a laboratory report and a comprehensive quiz. The former was used to reflect the understanding of the experimental process. The score of the laboratory report from the total of 40 points is shown in the table below.

Table 1. Score of laboratory report (Total score is 40 points)

Minimum	Maximum	Mean	Standard Deviation
31.00	40.00	38.75	1.53

From Table 1, it is found that the majority of students have a clear understanding of the experimental process. Students can write the steps of the experiment that they learnt from video. Their scores are ranging between 31 to 40 with the average score of 38.75

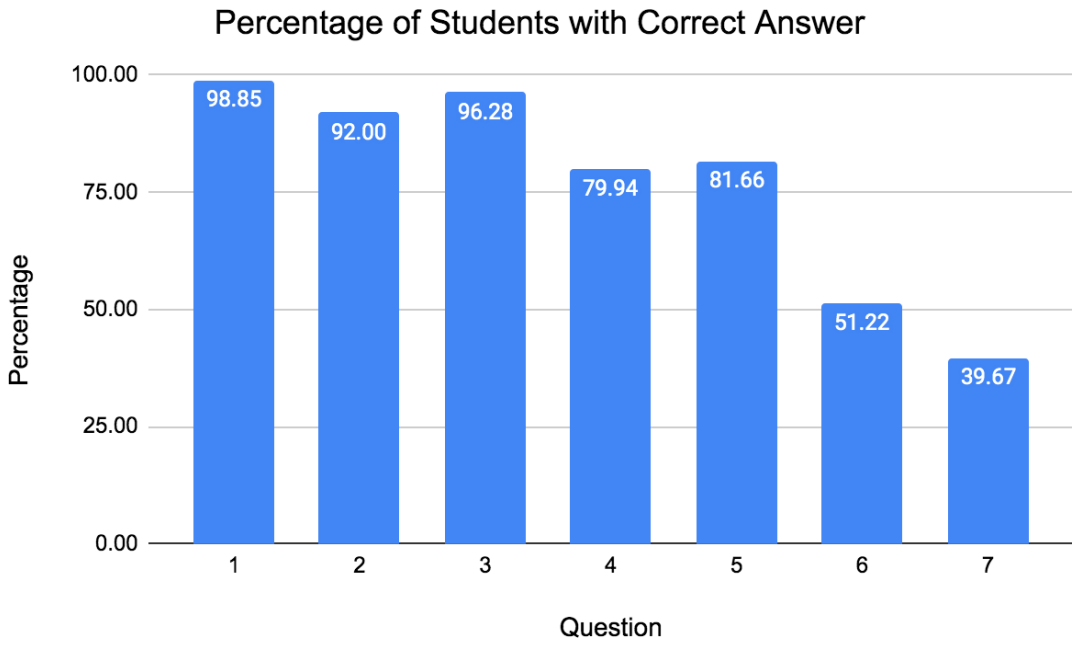
out of 40.

The comprehensive quiz at the end of the semester was used to assess data analysis, evaluation and interpretation skills related to the experiment. The quiz consists of 7 questions as follows.

Table 2. Task required in each question of the comprehensive quiz

Question	Task
1	Analysing data (finding mean) and reporting with appropriate significant figures
2	Writing appropriate units.
3	Reporting with appropriate significant figures
4	Analysing, evaluating and presenting data
5	Analysing data (finding slope for the line of best fit) and reporting with appropriate significant figures
6	Reporting with appropriate significant figures
7	Analysing uncertainties and the interpretation of the accuracy and precision of the final result.

From 349 students, the percentage of students who responded with correct answers in each question is shown in the graph below.



the comprehensive quiz

Most of the students (about 80%) correctly answered Questions 1, 2, 3, 4 and 5 which involve analysing simple data, presenting data in the graph format and reporting with appropriate significant figures. However, below 50% to about 50% of the students can answer Question 6 and 7 correctly. According to the quiz score, about 48% of the students have difficulties in reporting the final result with correct precision and accuracy. This difficulty can also be seen in the score of question 7 which involves interpreting the accuracy and precision of the final result. This is evident as the number of students who got the wrong answer increases to 60%. This difficulty may arise as it requires a deeper analytical thinking.

2. STUDENTS' PERCEPTIONS

From 349 students enrolling in this course, 113 students responded to the perception survey. The survey questionnaire consists of two parts—multiple-choice questions applied for quantitative analysis and open-ended questions for qualitative analysis.

1. Results from the perception survey

The quantitative method assessed students' perception by using one rating scale question to evaluate overall teaching presence and seven questions of 5 points Likert-type scale: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. The results can be described in three manners as the following.

- **Instructors (Teaching Presence)**

About half of responded students rated for the overall teaching presence as 10 scaling from 1(terrible) to 10 (outstanding) as shown in Figure 4.

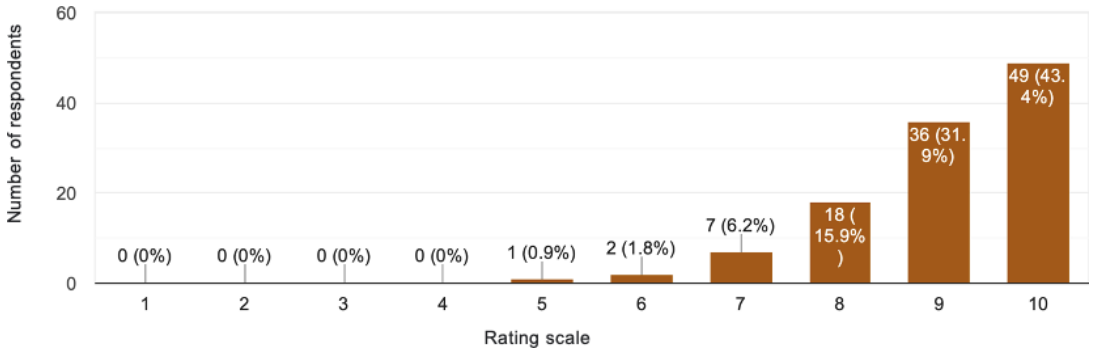


Figure 4. Percentage of responded students rated for the overall teaching presence

Nearly 70 percent of respondents strongly agreed that the instructor demonstrated and communicated content knowledge to them. They have a good understanding of the experimental process and can apply what they have learned from even online platforms to conduct laboratory experiments by themselves. In contrast, only three students had a neutral feeling about this question. Unlike the instructor's evaluation

result, only half of the students strongly agreed that the teaching assistant (TA) had facilitated them in this remote teaching environment. The numerical results for these two questions are shown below.

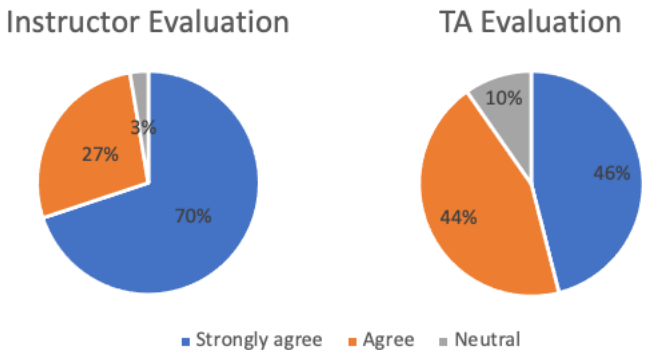


Figure 5. Students' perception of the instructor and teaching assistant (TA)

- **Instructional Media**

There were two media evaluated in this course; slides and Kahoots. The central part of respondents concurred with the efficiency of slides and Kahoots that encouraged and probed their understanding. However, two students had different opinions; one of them strongly disagreed with using Kahoots (see Figure 6).

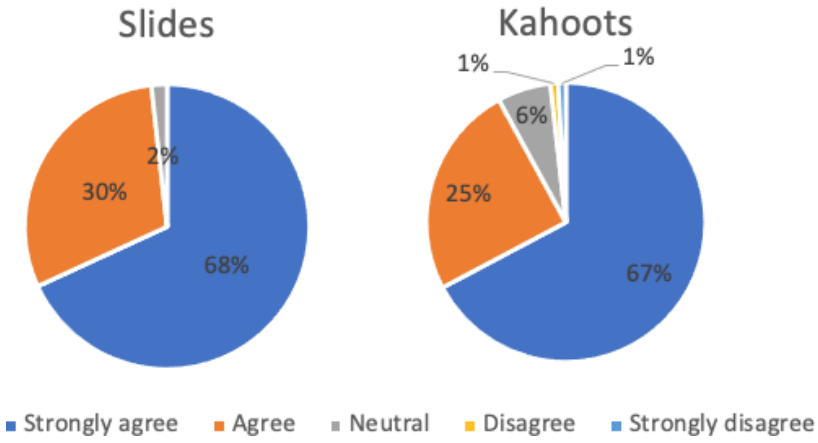


Figure 6. Percentage of students who responded to instructional media

- **Course Learning Outcomes**

The survey also assessed students' perceptions in terms of the course learning outcomes (CLOs). Three outcomes were questioned;

- CLO 1: reporting data with appropriate significant figures,
- CLO 2: presenting data with graphs, and
- CLO 3: analysing uncertainties and interpreting the accuracy and precision of the final result.

After the course, 77 out of 113 students strongly agreed that they could report

with appropriate significant figures (CLO 1). While the number of students who strongly agree with CLO 2 and CLO 3 was less than CLO 1. Respondents to CLO 2 and CLO 3 were relatively the same. the number of respondents to each CLO in Figure 7.

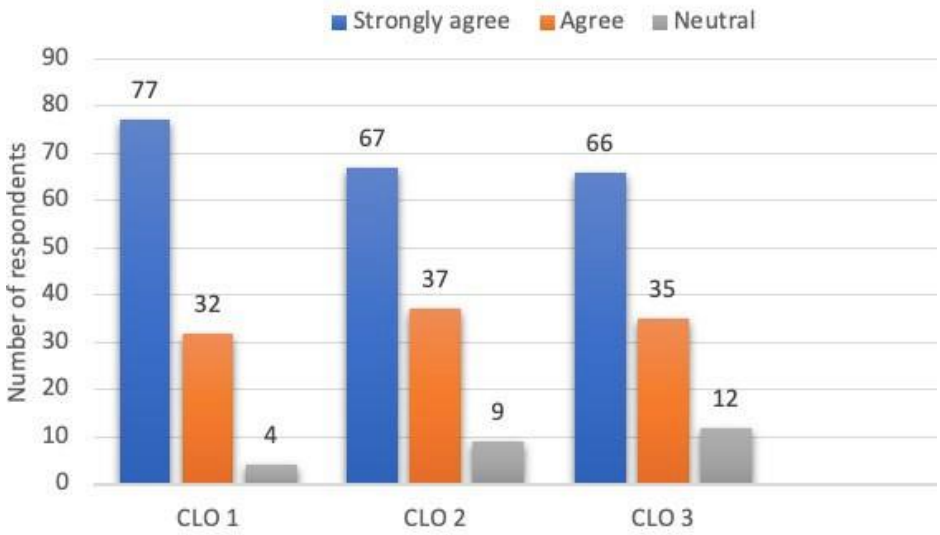


Figure 7. The number of students reflected their ability in each course learning outcome.

2.2 Results from the Open-Ended Questions

The more detailed analysis was also collected using open-ended questions. The majority of the students made the comments that Kahoot was a successful tool to help stimulating and promoting students' learning during the online session. The evidences are shown below.

"I like the use of Kahoot when the teacher finishes explaining. This prevents me from being sleepy and makes me understand the contents."

"I like Kahoot as it helps me identify the points that I misunderstand. Especially those points that I think I already get them, but I get them wrong when I play Kahoot. Kahoot helps increasing my understanding of the topics. I also like the teacher's explanation very much. The explanation is in depth and easy to understand "

"I like the way the teacher teaches first and then follows by doing Kahoot to test myself "

"The class is unique as it uses Kahoot in teaching."

"I love the way playing Kahoot and then following by the explanation"

"The teacher used Kahoot to explain how to record the results of the experiment with correct precision and accuracy. This helps me to have a clearer image of what we are doing than the class I used to experience before. The activity looks very challenging."

"Using Kahoot as a teaching tool makes the class not boring."

"Introducing Kahoot into teaching made me more focused, attentive and

understandable."

"Using Kahoot in teaching made me more enthusiastic about learning."

In addition, the students are satisfied with another technique in the online laboratory, that is, the teacher taught step by step and explained in detail.

"I like a clear step-by-step teaching method."

"More detailed explanations about significant figures are given."

"Explaining clearly, easy to understand, not too slow, not too fast."

"Explanation is thorough and clear."

"The instructor teaches with deep details."

"Teacher explains very well that I fully understand the concepts. I like this class very much."

"I can visualise the content clearly."

2.3 Recommendations from the Students

Though the online class seemed to be successful. There are two points in which we could further address and seek for improvement. The first suggestion is the speed and pace of the lecture. Even though the majority of the class commented that the pace was right. There were a minority of the students who perceived that the class was yet too fast. The example of the comments is shown below.

"Explain slowly please."

"Speak a little more slowly please. I cannot follow some topics."

Another recommendation from the students was to upload the handout prior to the class. The current practice was that the handout and related documents were uploaded after the class. This recommendation can be done in the future. The example of the comments is shown below.

"I would like you to give the additional documents before the lecture."

CONCLUSION

The online laboratory learning unit on the topic of Planck's constant in physics was developed for undergraduate students during the pandemic. The results from a laboratory report and a comprehensive quiz indicate that the majority of students passed analysing simple data and reporting with appropriate significant figures topics. However, there are some topics such as analysing, evaluating and presenting data, analysing uncertainties, and interpreting the accuracy and precision of the final result, which the students still find difficult in learning laboratory via online. The results from the perception survey show that the two main factors that help reinforcing the success of the online class are the teacher and the online teaching tool such as Kahoot. Moreover the minority of the students suggested that the pace of the lecture may be too fast for them and the handouts and supplementary materials should be given prior to the online session.

The authors believe that teaching and learning in the post-COVID time will inevitably change. While online teaching is currently not fully replacing face-to-face

teaching for whatever reasons, this has created new perspectives on education, such as the introduction of applications and digital tools as educational support for both students and teachers. Teachers may spend this time taking an opportunity to create or redesign an offline course to be online. By the way, a big question is *"Is the designed course effective enough for promoting students'learning?"*

To tackle the question, teachers as the course developer can create some questions to investigate students' perceptions after implementation of an online course. Not only students' perceptions and feedbacks of learning activities or the course are valuable for teachers to improve the specific course, but it could provide key information for educators, academia and government elsewhere would bring the results to encompass the way for designation curriculums, educational resources, etc. for developing an effective online course in the future. Because the authors also believe that for being a good teacher, we need to remind ourselves that students' voices cannot be neglected.

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Science methods courses in the COVID-19 pandemic: Challenges in the hybrid classroom

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Abstract

Like other countries, Thailand has been contending with the coronavirus disease of 2019 (COVID-19) pandemic since the beginning of 2020. Across the world, challenges and difficult situations have emerged because of the pandemic. Universities also face challenges in providing education for all learners.The university at which the author teaches was temporarily closed from March to July 2020 as a result of COVID-19 concerns. All classroom operations, exams, academic assessments, reports, and presentations were conducted using the online format. Regular class operations were resumed for a short period, from July 2020 to January 2021. However, the university suggested avoiding in-person classes and adopting alternative pedagogy methods, such as online learning/teaching, assignment-based instruction, and project-based learning. Blended learning was promoted by the university. Blended learning has been promoted in the science method course, which is consisted of face-to-face and online learning.

Since January 2021, all classroom operations and academic assessments have moved entirely online again. Within the university, the Faculty of Education provides many practice courses and laboratories to accommodate this. Most teaching practices need to be carried out in school with students. The science methods course is compulsory for preservice science teachers; it consists of both lectures and a laboratory in which the preservice teachers practice their teaching with peers and school students. During the pandemic, the author tried to address the difficulty of conducting the course by looking for strategies to promote preservice teachers' learning, foster preservice teachers' positive attitude toward learning to learn in the pandemic period. The author studied the choice of appropriate technological tools for preservice teachers in science methods courses. This article explores the good practices for science methods courses in the COVID-19 pandemic, focusing on the course offered during the first semester, academic year of 2020.

At present, most classroom operations, exams, academic assessments, reports, and presentations need to be conducted using the online format. Blended learning is a method of offering science methods courses that allows preservice teachers to practice face-to-face teaching and engage in reflection online. The instructor observed and reflected on her teaching through the instructor's log and the preservice teachers'

reflective journals. Thematic analysis was used for data analysis, which resulted in the five following themes:

1) Instructors should be open-minded, flexible, and ready to learn new things. Moreover, they should encourage the preservice teachers to be more flexible and adaptable.
2) An appropriate learning management system (LMS) is crucial for the methods course in terms of providing the information and activities for each week, assignments, and reflective journals. Instructors should look for user-friendly LMSs for the learners.
3) Hybrid methods of microteaching allow preservice teachers to practice their teaching in a physical classroom and conduct online reflections.
4) Various technological tools can be selected for synchronous and asynchronous learning.
5) An effective digital support system is needed.

This article concludes by clarifying the importance of the instructor's role, observing that good practices begin with instructors who are ready for change, engage in self-development, and provide appropriate technology and content for learners using their technological pedagogical content knowledge.

Background

During this challenging time in the context of the coronavirus disease of 2019 (COVID-19) pandemic, science methods course are faced with complex problems. As a general practice, preservice teachers can enter schools to practice teaching in the presence of school students. However, during the pandemic, they have not been allowed to visit schools. Blended learning is a method used for science methods courses; not only have previous studies found that most students have positive perceptions of blended learning used in science method courses (Yılmaz & Malone, 2020), but this approach has also been identified as appropriate for increasing online learning (Darling-Hammond et al., 2020). The author makes extensive effort to help preservice teachers learn and practice their teaching through online learning. However, it is important for the author as an instructor to select appropriate technological tools for preservice teachers in science methods courses and search for good teaching strategies for online courses in this domain.

According to previous studies, it is difficult to compare online and face-to-face classes because the quality of interaction in class and students' perceptions are different (Landrum et al., 2021). Moreover, some studies have reported that many faculty members and students do not see the value of learning that takes place fully online (Hew et al., 2020). Some research has shown a negative effect of the COVID-19 pandemic on national examinations (Sintema, 2020). There have been many interesting findings on student's learning in online environments from research studies conducted

in the past few years. For example, students' online learning readiness and motivational factors influence their learning outcomes (Bovermann, Weidlich, & Bastiaens, 2018; Joosten & Cusatis, 2020). Students' satisfaction with online learning depends on their expectations regarding the time and space of online learning, self-motivation, and the role of others, including both other students and the teacher (Landrum et al., 2021). Many research studies have explored various online teaching tools or strategies to promote students' learning (Gregory & Bannister-Tyrrell, 2017; Hew et al., 2020).

The instructor is an important figure in online learning. Instructors should have sufficient knowledge and skills to integrate technology into instruction in specific content areas; such ability is referred to as technological pedagogical content knowledge (TPACK; Herring et al., 2016). Instructors need to know how to identify topics to be taught using information and communication technology (ICT), identify appropriate representations for the concepts to be taught, identify teaching tactics that are difficult to implement by other means, select appropriate tools, and infuse online activities with appropriate learner-centered strategies (Angeli et al., 2016). However, few research studies have explored the online science learning environment (Jaber et al., 2019) and online science professional development program (Dini et al., 2021). This article explores good practices for science methods courses during the COVID-19 pandemic.

Methods

The science methods course is a compulsory undergraduate course for preservice science teachers in a university in Bangkok, Thailand. There were 19 preservice teachers enrolled in academic year 2020. The course involves two parts—lectures and laboratory work. In the lab component, preservice teachers can practice their teaching with their peers and school students. However, during the COVID-19 outbreak, preservice teachers in the program could not enter schools to teach real students. The author is one of three instructors in this science methods course; she is a science educator who has taught this course for 10 years. To adapt to the new requirements under the pandemic context, she aimed to explore the good way to teach online and choose practical tools for promoting preservice teachers' learning. This study collected data from the instructor's log and preservice teachers' reflective journals. Thematic analysis was used for data analysis.

Results and Discussion

The findings illustrate good practices for the science methods course during the COVID-19 pandemic in the author's experiences. Five themes emerged from this study, as described below.

1. Instructors should be open-minded, flexible, and ready to learn new things.

Flexibility and adaptability are necessary intrapersonal skills in our contemporary world (Care et al., 2019). As instructors, we need to be ready to work in every situation. For example in this study, it was found that the two versions of lesson plans (face-to-face and online versions) helped the author prepare for teaching in all situations.

2. The need for an appropriate learning management system (LMS)

Google Classroom is the learning management system (LMS) used in this course. Most preservice teachers are familiar with Google Classroom and G-Suite (now Google Workspace), which they used before the pandemic. In the science methods course, Google Classroom consisted of information and activities for each week, assignments, and reflective journals. It is easy for instructors and preservice teachers to access and participate in Google Classroom. The instructor and learners can announce news or information on the stream (Figure 1(a)). Moreover, the activities for each week are set as classwork, which is easy to search (Figure 1(b)). Other functions in Google Classroom are appropriate for the course, such as different activities and grading.

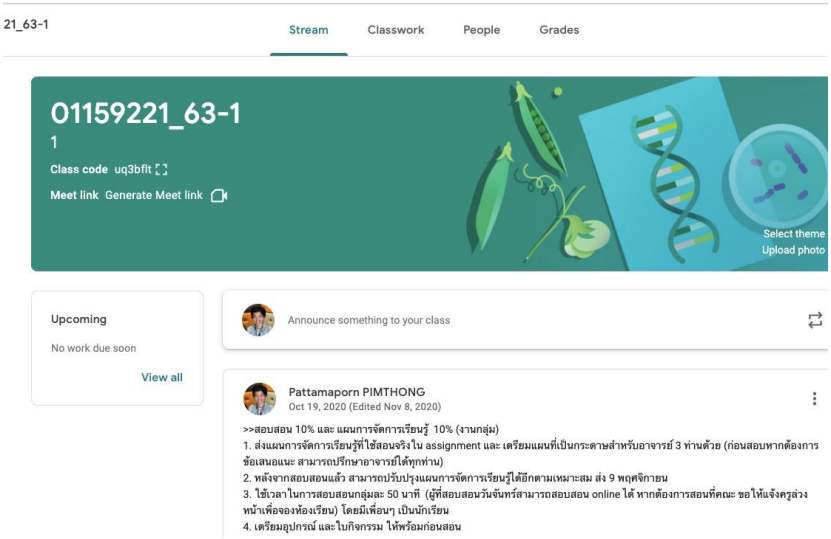

Figure 1(a). Google Classroom stream

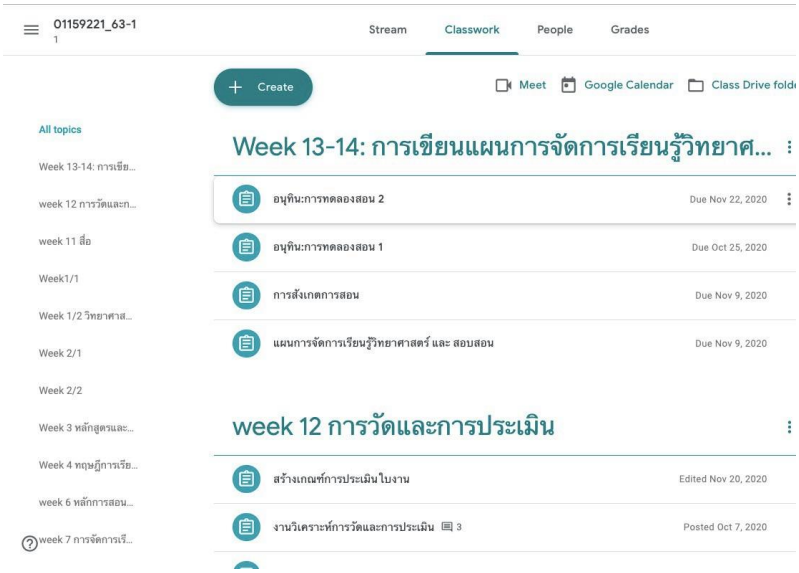

Figure 1(b). Google Classroom classwork

3. Face-to-face microteaching and online reflection

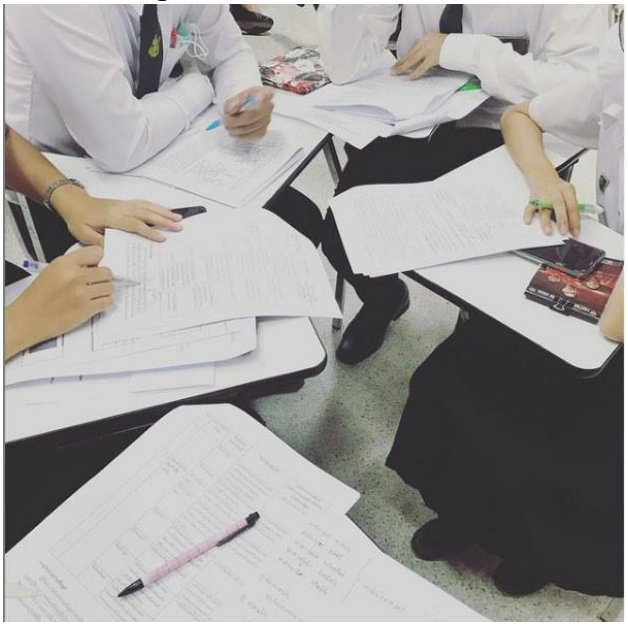

Figure 2. Face-to-face learning

During the pandemic, preservice teachers could not practice their teaching with school students. Instead, they engaged in microteaching with their friends. The micro-teaching took place in a physical classroom (Figture 2) in weeks 13–15 of the first semester based on the university announcement regarding blended online and classroom operation measures, examinations, and academic assessment. The hybrid method was implemented. The preservice teachers turned in their lesson plans and received feedback in Google Classroom. They then came to a physical class for

microteaching. At the end of microteaching, the preservice teachers reflected on their teaching and gave feedbacks to their peers via reflective journals and discussion boards.

4. Various technological tools for synchronous and asynchronous online learning

As mentioned above, TPACK is important for instructors who need to use technology in teaching. The integration of technology represents the connection of pedagogy, technology and content knowledge; these elements are then applied in multifaceted and dynamic classroom contexts (Koehler & Mishra, 2009). In the science methods course, the author encouraged the synchronous mode of online learning for discussion, presentations, giving feedback, or group work. The methods course uses Zoom as the main videoconferencing tool because it is easy to use and has many functions to support the scheduled activities (Figure 3(a)). For example, the instructor can sending invitations/links to the meetings beforehand (Figure 3(b)). Breakout rooms allows the instructor to split preservice teachers into separate, smaller groups for discussion. Chat and private chat functions allow the preservice teachers to send public messages to the group or private messages to other participants. Meeting polls allow the participants to vote. Emojis and virtual backgrounds allow all participants to express their moods or feelings.

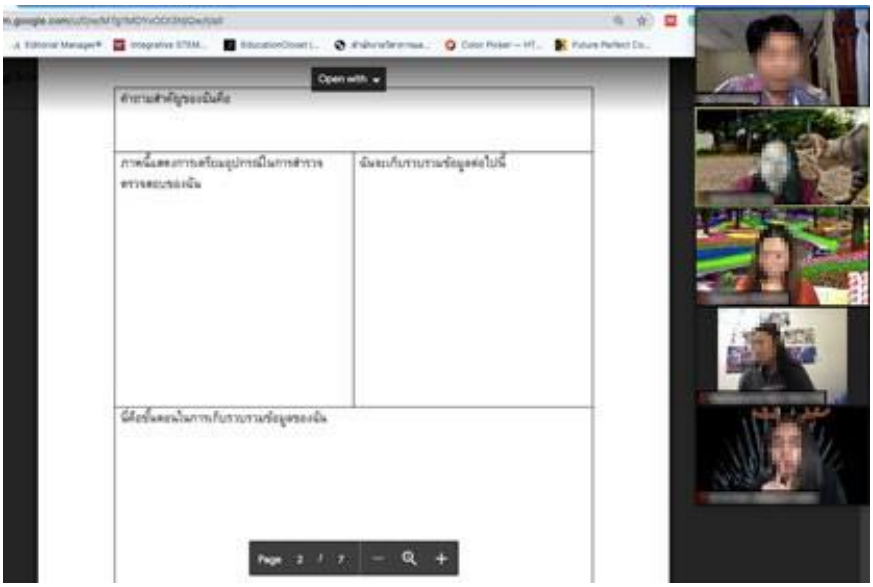

Figure 3(a). Online class via Zoom

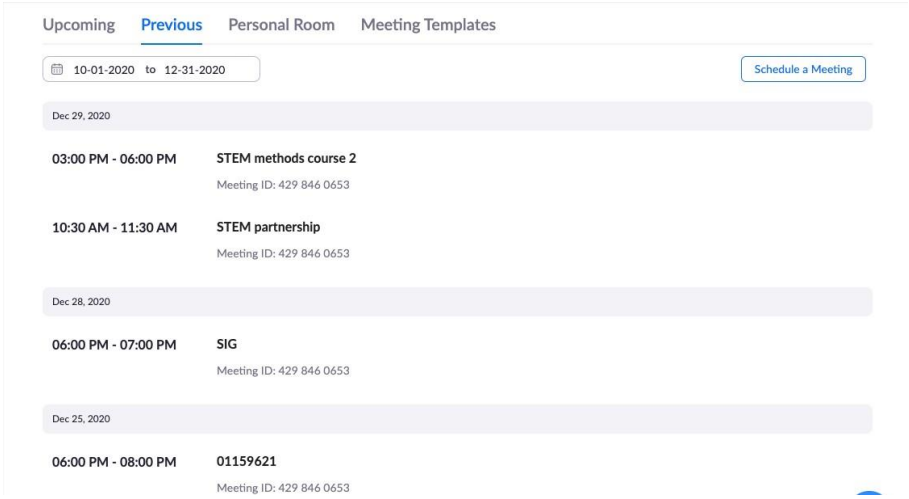

Figure 3(b). Zoom schedule

Padlet (https://padlet.com/dashboard) (Figure 4) is a tool for discussion that offers synchronous and asynchronous modes. It is a popular discussion board that allows preservice teachers to post their projects, ideas, or information. The participants can respond or comment on the posts. Most preservice teachers love to use the discussion board and give "hearts" to their friends.

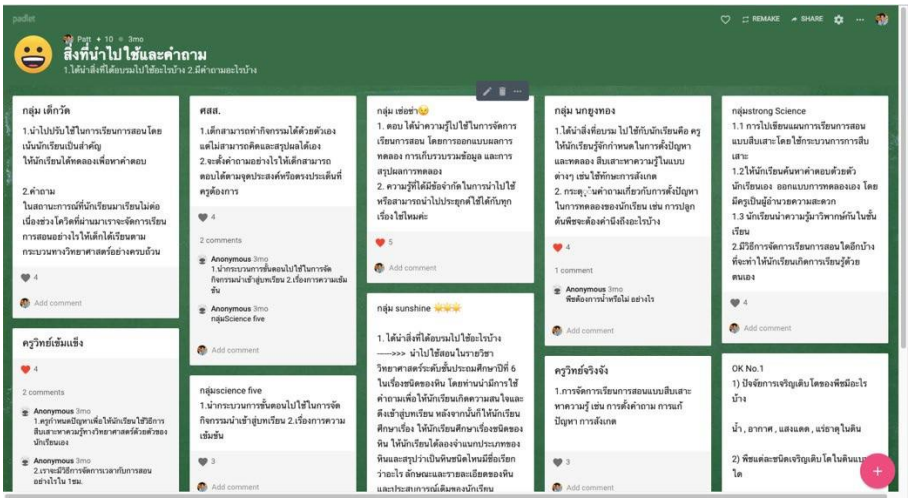

Figure 4. Discussion board in Padlet

kahoot (https://kahoot.com/) (Figure 5) is another platform that works for both synchronous and asynchronous modes.

Figure 5. Two modes of activities in kahoot

In asynchronous mode, the instructor prepared a PowerPoint presentation, video lectures, and information for the learners to study before coming to class. Loom (https://www.loom.com/) is a video messaging tool in which the instructor can prepare presentations or video lectures for the learner. Moreover, everyone can post or give feedback on the Loom website (Figure 6).

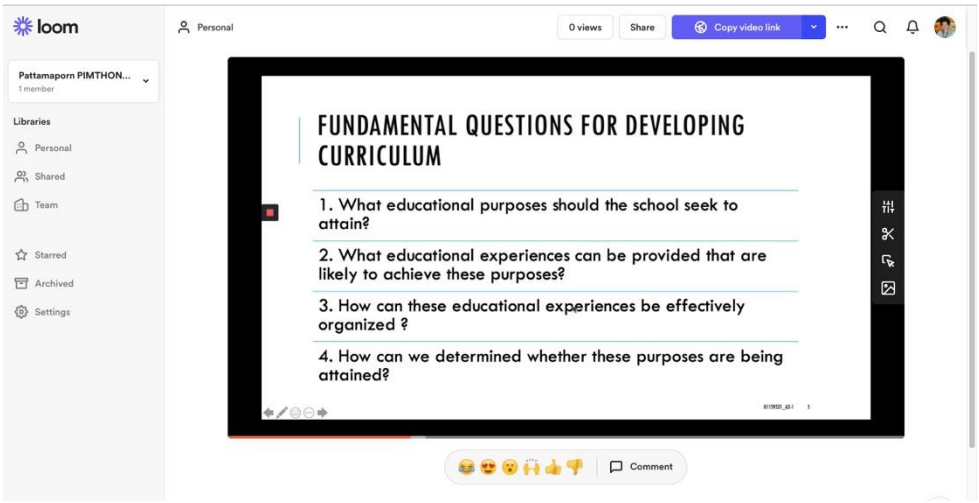

Figure 6. Video lecture in Loom

5. Digital support systems

An organization, university, or school should provide enough digital support for its members. For example, members should have access to software licenses and LMSs and be able to consult with information technology (IT) staff (Figure 7).

Figure 7. Digital support system

Conclusion

Good practices begin with instructors. Instructors should be open-minded, flexible, and be ready to learn new things. They need to be able to provide appropriate technology for learners, as well as content.

Acknowledgments

The author is grateful to Kasetsart University and the Faculty of Education for providing a very good digital support system.

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Online Teaching and Learning During the COVID-19 Pandemic in 2020: A Case of Business Education Program, Chiang Mai University

Phetcharee Rupavijetra[1]

Abstract

This study showed the situation and solution of an academic staff at the Business Education Program, Faculty of Education, Chiang Mai University, Thailand on academic working tasks, teaching and learning process after the sudden shift from face-to-face to online distance learning due to the COVID-19 lockdown in February, 2020. The author used the 'Zoom' software which was provided by the university for online teaching and learning and used 'Zoom' and 'Google Meet' to attend meetings with both domestic and international organizations. Data from the survey with 40 students found that a majority (97%) of the students who answered the survey agreed that the university online learning employed during COVID-19 lockdown was easy to use and they liked this style. Also, a majority with highest satisfaction (98%) agreed that it was easy for students to log into the portal at any time. A high majority (97%) agreed that one of the advantages of the teaching and learning was that there were multiple ways to access from equipment like mobile phone, computer, or laptop. However, 2% of the students voiced that it was not easy to obtain stable internet at their dormitories. They sometimes experienced lost internet connection and had to attempt several times to reconnect.

In addition, a majority of students (98%) agreed that lectures for online learning were presented in an organized and understandable manner. Most students (98%) were satisfied with the diversity of presentations of lecture videos, PowerPoint presentations, manual documents, the questions raised, and discussions during the online sessions. Nonetheless, some students were not ready to learn with the online system as they woke up late. Some did not shower and get dressed properly while studying online (they were allowed to wear casual dress or uniform). The instructor's impression on online teaching and learning was that it was an interesting and useful style of teaching and learning in the advanced technological era. However, sitting and staring at the computer screen for 40-60 minutes each class, and prolonged hours each day, created stress and resulted in office syndrome (back pain). In addition, the instructor had to buy additional equipment such as microphone, headphones, and green fabric for making green screen used when teaching and meeting online. These materials were not expensive and could be found in electronic shops or online purchases.

1. Introduction

It is undeniable that living in the 21st century, advanced technology is important for human life, especially in education. Indeed, technology contributes significantly to the access and acquisition of information, data, and thus the development in every field. E-learning or online learning is one of the most significant contributions of technology to learning in

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educational institution and daily life. As Harrison and Mather (2016:139) argued that when knowledge production, transmission, and acquisition are purely instrumental, online learning may in fact be superior to the conventional classroom.

For online education or learning, the learner can control his/her education system by managing the learning process, the content of the learning process, and communicating with instructor and classmates in the learning process. With well management, E-learning or online learning is useful for both instructor and learner. Especially, it provides the learners with many programs that deliver immediate reference to what the learner is asking for or must learn, by providing discussion forums and allowing questions to be asked and answered. Even before the COVID-19 pandemic, there was already high growth and adoption in education technology, with global edtech investments reaching $18.66 billion US dollars in 2019 and the overall market for online education projected to reach $350 billion by 2025. Whether it be language virtual tutoring or video conferencing, there has been a significant surge in online learning software in usage since the spread of COVID-19 (Li and Lalani, 2020). However, E-learning or online learning has not been accepted everywhere especially in developing countries where face-to-face learning is the traditional style of learning at schools and educational institutions. As online learning is rather new for some, older people tend not to be familiar with it and need facilities to support such as reliable internet system, a laptop or computer.

In accordance with the economic roadmap, Thailand 4.0, which aims to use technology and innovation to develop the country, Chiang Mai province has been assigned to pilot a smart city development scheme along with seven other provinces. Chiang Mai University, located in Chiang Mai, is in itself like a small town and has been selected as part of the Chiang Mai smart city initiative. It has a population of about 30,000 plus people as well as its own facilities, including hospitals, research centers, its own public transportation system, dormitories, banks, a sports stadium, etc. Such inclusiveness sets it apart from other northern universities, allowing it to take great strides in using its unique ecosystem to implement its own miniature version of a smart city/university that applies technology in every area especially in teaching and learning. To meet the target, Chiang Mai University has provided software applications and training programs for all faculty members in order to support and equip academic staff with new skills along with new attitudes towards technology since 2017 (Chiang Mai University, 2017).

2. Situation of changes in teaching and learning

As the COVID-19 pandemic has significantly affected people's lives globally, higher education institutions, including schools around the world had to cancel their onsite classes and shifted their pedagogical processes to online methods since late February 2020. For some universities, the online mode of delivering learning and teaching was not new, unlike others which encounter online methods as a form of teaching for their first time. This transition was swift and there was not much time for preparation. On the other hand, students from undeveloped, remote, and rural areas experienced problems with poor internet connectivity, lack of equipment or even lack of electricity.

Teachers also had to adapt to new pedagogical concepts and modes of delivery of teaching, for which they may not have been trained before. In particular, learners in the most marginalized groups, with no access to digital learning resources or lack the resilience and engagement to learn on their own, have been at risk of falling behind (Schleicher, 2020:4).

The pandemic and lockdown have also affected the teaching and learning conducted at the Business Administration Program, Department of Vocational Education and Wellness Promotion, Faculty of Education, Chiang Mai University, Thailand. I am an Associate Professor in this program who is a senior academic retiring soon. During the pandemic, I had to promptly change the style of teaching to be online via the 'Zoom' application. Luckily, for many years before the pandemic, Chiang Mai University has already been attempting to gear the campus to be a smart university and implementing technology like ICT to all areas of the university especially in teaching and learning. Particularly in 2019, there were a lot of seminars and meetings at the national level on technological disruption which would affect higher education institutions because of the decline in number of students and with the advancement of technology. Young people will also tend to learn by themselves or access the internet to research on information that they are interested in.

This means that all universities must adapt and improve their management and create courses that attract the new generation or else they will be risked of closure. Many arguments on this matter suggest that academic will be impacted till at least the year 2023. To adjust, Chiang Mai university has called upon this challenge starting from distributing 'Zoom' accounts and Microsoft Office software were provided for the faculty members as well as the training programs and instruction.

Acknowledging this challenge, though retiring in 2023, I continue to adapt and develop myself to utilize technology in daily life and have found it beneficial for the teaching process. Even though at the time I was not familiar with online meeting software and applications, I immediately applied for an online 'Zoom' account once the university announced that accounts were provided for all academic staff.

As the COVID-19 situation aggravated in Thailand in February 2020, I organized well on my teaching tasks with my students in 4 courses by communicating with them via the 'Line' mobile application and assigning assignments and receiving submitted work from students through email. This was not a great shift because in general I had already been using the application for further communication with my students before and after class. The platform had been used to hand out assignments, send related news and information on the course, and stimulate discussion. Students were also able to directly contact me. For examinations, I had used the 'Line' application and the 'Zoom' application like meeting and teaching by setting the time and call all students to be ready to take the examination and sent the examination sheet to them via 'Line' application share screen via 'Zoom' application also and set time for finish and let students sent their papers to me via email. I requested the students to be honest and turn on their cameras so I could observe their activities.

In March 2020, I still went to work at the office because my office is located isolated from other buildings and working at home was not comfortable for me as the internet system and working space was not well prepared. If students needed to visit me at the office, they had to inform me in advance via 'Line' application and had to wear face masks and wash their hands before entering the office.

Learning how to use the 'Zoom' application from available sources on the internet was not successful for me to understand and use it properly. Therefore, I requested my master's degree student to set up the system for using it correctly as I had to participate in oral examinations for master and doctoral students in April and May respectively. At first, I felt that

this technology was not easy for me who is an older person, but it was required to communicate with my students and family members, so I became familiar with it quickly.

I used 'Zoom' and 'Google Meet' for meetings with the faculty and also with both domestic and international academic organizations during summer school from March to June 2020. It was indeed very useful for working during the social distancing and lockdown measures. Later, Chiang Mai University also provided 'Microsoft Team' and Canvas account for instructors as the alternative, but I did not use it as I found it more complicated and had already become familiar with 'Zoom'.

3. First semester of 2020 during July to October

For the first semester of 2020, Chiang Mai university opened on 8 July, I had to teach 4 courses, 076425 (Self-employment program), 076430 (Doing business in ASEAN), 076444 (Special lecture in Business), and 100498 (Teaching preparation, students are working at school for 45 hours). My courses had a small number of students between 2-12 students for each course.

With high COVID-19 preventive measures, the Faculty of Education scheduled 100 percent online classes for 2 months with no onsite classes at all. I had to adapt to the method of teaching and prepared extra documents to use via online teaching. Online teaching in this paper means that the lecturer teaches the students at the normal time set for each course, but students did not have to go to the classroom. They attend class via 'Zoom' from their house or dormitory, and the lecturer conduct lectures from home, office, or classroom alone. Indeed, the instructor had to motivate students to discuss the content and ideas after giving a short lecture and students could not leave the screen.

From September 2020, there was a period when the spread of COVID-19 was under control and the government had eased the lockdown and preventive measures, so people were allowed to live a new normal lifestyle. Therefore, classes were conducted onsite again as after the midterm examination, students had practice sessions, like selling products, organizing special lectures. But for the course 100498 (Teaching preparation, students were working at schools for 45 hours) there were 11 students in this course, we had to have a meeting 4 times in July, August, September, and October, so we use online meetings by using 'Zoom'. Students learnt how to conduct the meeting via online well, including oral presentations with PowerPoint presentations.

4. Results

This study examined the situation and effects of the sudden shift from face-to-face to online distance learning due to the COVID-19 lockdown and the solutions for teaching and learning, and working in the Business Administration Program, Chiang Mai University.

A total of 40 students were studying at the Business Administration Program and enrolled in 4 courses; 3 courses were lecture courses, and 1 course was school preparation practice. Students showed satisfaction on online teaching and learning during the COVID-19 lockdown in the first month at highest level (97%). They understood that the situation was sudden, though they expressed that if they had to stay at their dormitories for any longer, they might be unhappy and more stressed. As for online learning, students commented that it was not the best style for studying as they need human interaction and face-to-face communication.

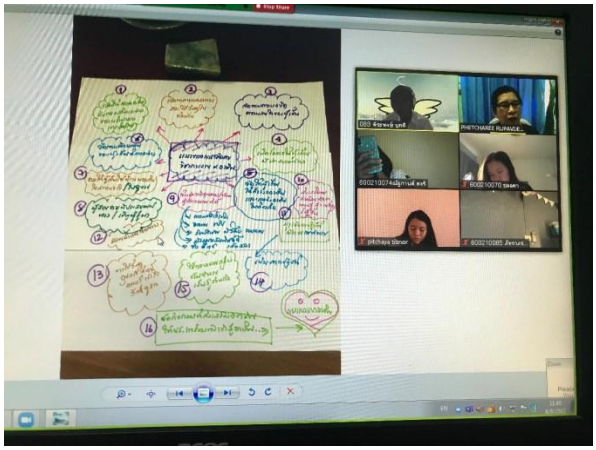
However, they understood the situation and were happy with the overall online learning during COVID-19 pandemic.

The answer of survey from 40 students showed:

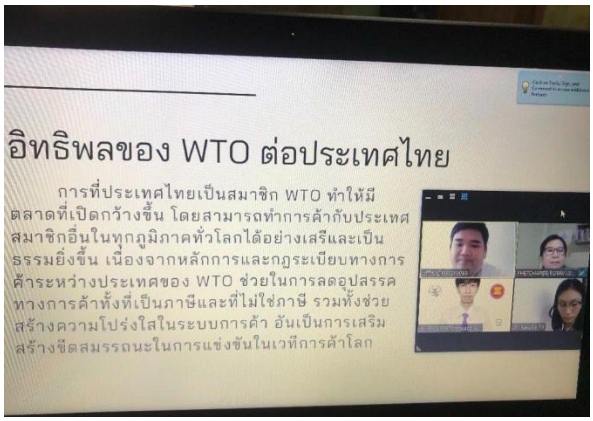
A majority (97%) of students who answered the survey form agreed that the university online learning employed during COVID-19 lockdown was easy to use and liked this style. Also, a majority with highest satisfaction (98%) agreed that it was easy for students to log in to the portal at any time. A high majority (97%) agreed that one of the advantages of the teaching and learning was that there were multiple ways to access it from equipment like mobile phone, computer, or laptop. However, 2% of the students voiced that it was not easy to obtain stable internet at their dormitories. They sometimes experienced lost internet connection and had to attempt several times to reconnect. A majority of students (98%) agreed that lectures for online learning was presented in an organized and understandable manner. Most students (98%) were satisfied with the diversity of presentations of lecture videos, PowerPoint presentations, manual documents, the questions raised, and discussions during the online sessions. However, some students were not ready to learn with the online system as they woke up late. Some did not shower and get dressed properly while studying online (they were allowed to wear casual dress or uniform).

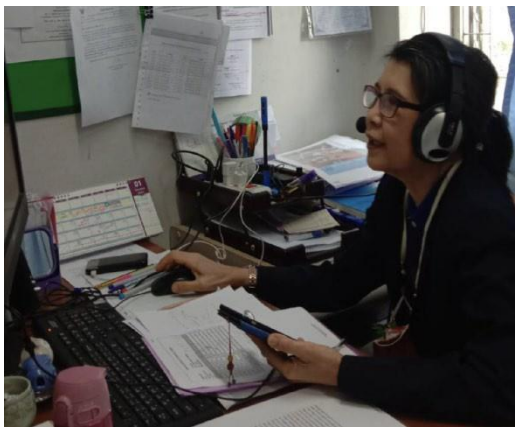
The instructor's impression on online teaching and learning was that it was an interesting and useful style of teaching and learning in the advanced technological era. However, sitting and staring at the computer screen for 40-60 minutes each class, and prolonged hours each day, created stress and resulted in office syndrome (back pain). In addition, the instructor had to buy additional equipment such as microphone, headphones, and green fabric for making green screen used when teaching and meeting online. These materials were not expensive and could be found in electronic shops or online purchases.

For working with master and doctoral students, we also used online presentation via 'Zoom' application. Students from both levels expressed that they liked this option for presenting their thesis at highest level because they felt comfortable to do so rather than the face-to-face presentation which they felt more stressful when presenting among professors. Moreover, the use of online presentation instead of face-to-face presentation until the COVID-19 situation is alleviates, not only is a preventive measure but also saves the students' transportation fees as they live in other provinces outside of Chiang Mai.



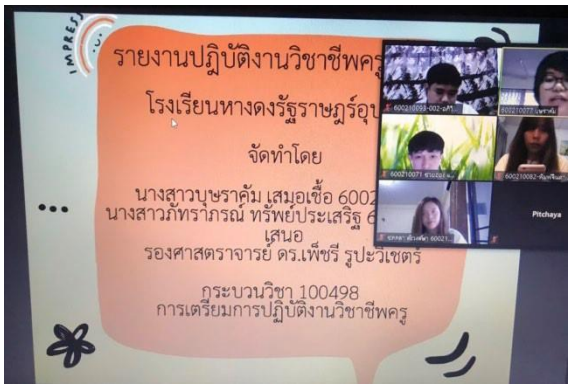
Online teaching for the course on Self-employment program



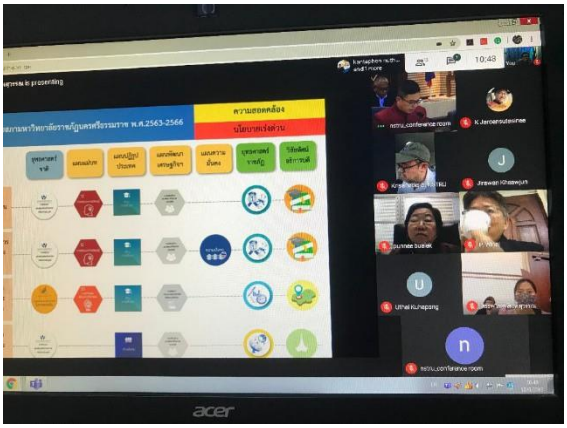


Online teaching on the course on doing Business in ASEAN

The instructor taught online via ‘Zoom’ and Line application on mobile phone.



Online teaching on the course on Teaching preparation



Online Seminar with international organization and meeting with other University in Thailand via Google Meet

5. Discussion

Online teaching and learning via technological communication methods instead of the face-to-face approach is essential for the 21st century, especially during the COVID-19 pandemic. In higher education level, utilizing technology for online learning seems less problematic as students already have their own media such as computer, laptop, or mobile phone, and access to the internet. Using online learning in this paper meant that instructor and students still interact by asking and answering and sharing ideas like face-to-face learning. However, to make online learning effective, effort from both sides is needed. The instructor and students need to collaborate to make it work. There needs to be good preparation and well-designed class materials from the instructor and motivation techniques to encourage engagement and concentration of students.

6. Acknowledgement

The author would like to thank Chiba University for providing the opportunity to share ideas and challenges of online teaching during the COVID-19 pandemic. Also thank you to Chiang Mai University for providing technical support and software for online teaching and meeting.

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Teaching and Learning During COVID-19 Pandemic in Faculty of Science and Faculty of Education, Chulalongkorn University

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Abstract

Online teaching and learning in Faculty of Science and Faculty of Education, Chulalongkorn University (CU) during COVID-19 pandemic has utilized several online learning management systems (LMS) with different advantages to fit the specific needs of variety of classes offered in the university. In this manuscript, we will give examples of our blended learning which focuses on online classes and online evaluations that were complied with the university guidelines for instruction, course management, measurement and evaluation. The contents were totally based on the authors' own experiences as examples, which may not represent the whole practices of both faculties.

Learning Management Systems (LMS)

Examples of the LMS mainly utilized in Faculty of Science and Faculty of Education, CU are Blackboard, My Courseville, Microsoft Team, which were fully managed and supported by the learning innovation center, CU. Besides, the university also provides licenses several live teachings and VDO tools for all faculty members to support the remote and online learning such as Zoom, Microsoft Team and Echo360, while the free online live streaming and VDOs through Facebook live, Google Meet and Youtube were also utilized in several classes due to their ease of access and content distribution. The advantages and utilization purposes of each LMS will be discussed below.

(i) Blackboard (BB)

BB was usually utilized in the moderate- to large-size classes (such as general subjects), where the evaluation platforms consisted of quizzes, assignments and exams and only registered students could access. The instructors could designed their own class organizations through the flexible platform of BB (an example was shown in Fig. 1). Variety of question styles and methods of answer were available in BB with options to be conditionally available at certain period of time and could be individually assigned to specific students. During examination, the answers were automatically saved in BB;

therefore, if there was the connection lost, the students could re-login and continue their work. However, if a large number of students were doing the assignment/exams at the same time, the system overloading precaution should be imposed.

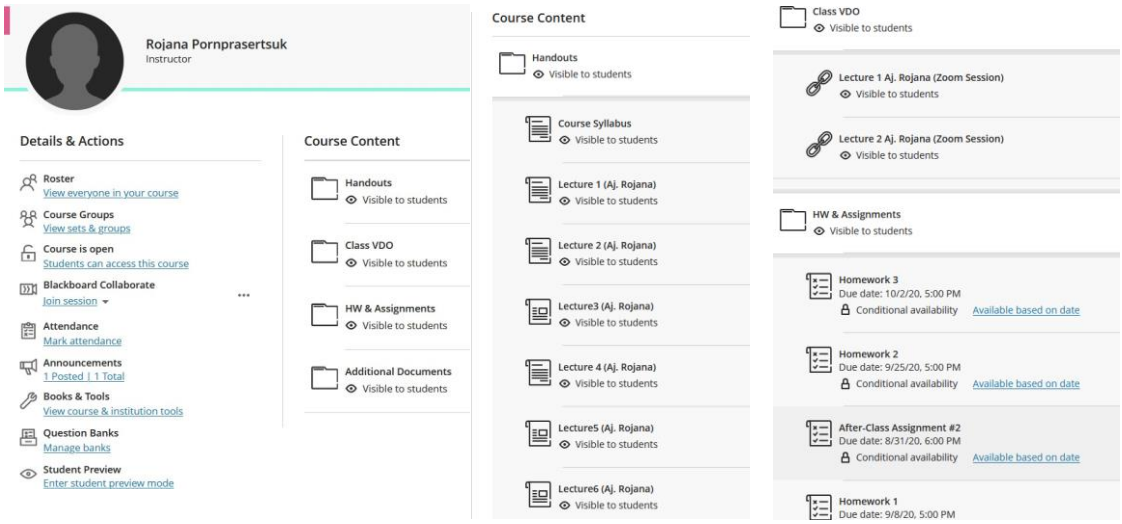

Figure 1 Example of Blackboard Class Structure Layout

(ii) My Courseville (CV)

My Courseville was commonly utilized in the small- to moderate-size classes with online quizzes, assignments and exams. The instructors could log in with CU account or Facebook. Several interactive tools were available for class interaction and could link the announcement to FB group (Fig. 2). However, the options for question styles and methods of answer were limited as compared to BB. This LMS was also convenient for hands-on or laboratory classes where students were separated into groups with specific assignments for each group.

(iii) Microsoft Team (MT)

MT was commonly used for meetings and seminar classes in Faculty of Science and Faculty of Education, CU. This LMS offered several advantages including its own live and VDO streamings which could be recorded and stored in MT right after the sessions. Furthermore, the assignments and quizzes could be assigned to all students or specific students, but the question style and methods of answers were limited compared to BB as well. This LMS was also convenient for seminar classes where the students could share their presentation files and checked their performance in the recorded VDO after their presentations.

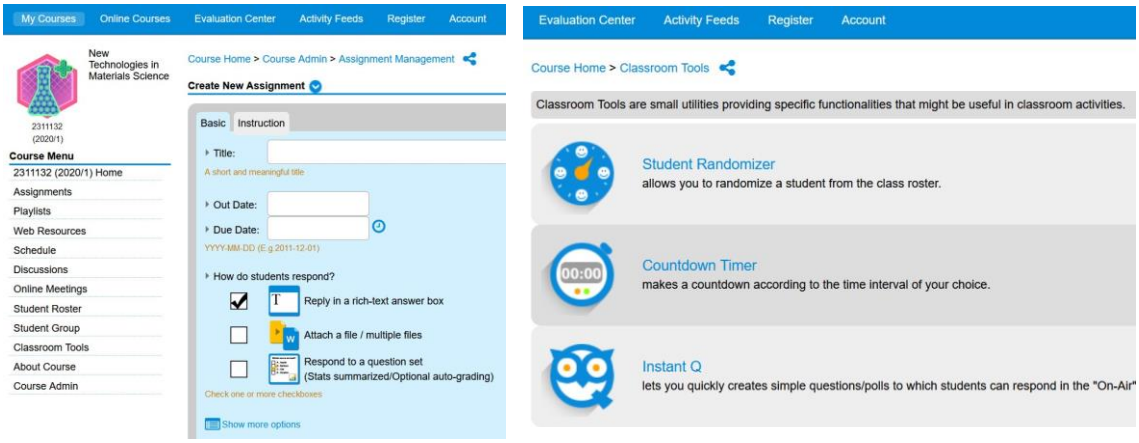

Figure 2 Example of CV class assignments and classroom tools

Online Lectures and Class Evaluation

According to authors' experiences, the online teaching in Faculty of Science and Faculty of Education, CU, could be categorized into 5 categories as followed:

(i) Large-size Class (ex. general science classes > 100 students)

Typically, the instructors utilized BB platform together with the live lectures via Zoom or VDO clips in Echo360 (or Youtube) which could be linked to BB. For online evaluation, the instructors usually posted the examinations in BB or Exam Plus in the combination with Zoom live streaming to proctor the online exams. Some classes also adjusted the evaluation methods to reduce the portion of online examination score.

(ii) Moderate-size Class (ex. specific subjects > 50 students)

The moderate-size classes typically utilized either BB or CV platforms for distribution of lecture materials and for class assignment and live lecture via Zoom or VDO clips in Echo360 or Youtube, which could be link to BB and CV. Similar to large-size class, the online examination was offered in BB, CV platforms or utilizing google forms in combination with Zoom live streaming to proctor the online exams.

(iii) Small-size Class (ex. specific graduate subjects < 50 students)

Small-size classes typically utilized BB, CV, MT, Facebook or Line groups for LMS to distribute handouts and assignments, while the live lectures were performed via Zoom or Facebook live. The evaluation methods were varied depending on the content of the class. Some classes chose to have the class or case-study reports, presentations, VDO clips as methods of evaluations, while some classes had take-home examination or online examinations through the class LMS or using microsoft form/google form together with Zoom to proctor the online exams.

(iv) Laboratory Class/Research/Thesis

Depending on the preventive measures during COVID-19 situation, if the students were allowed to study onsite, the laboratory classes would be organized such that

lower number of students were assigned per group to keep the social distancing. Some laboratory classes offered online VDO clips, and students must pass the quizzes before class. Similar preventive measures have been imposed for research and thesis, if the researchers/students were allowed to enter the buildings, only limited number of students were allowed per laboratory. All students, instructors and staff members must strictly follow COVID-19 preventive measures (i.e filled-in the risk assessment form, had a temperature check and checked-in to our entry registration system) before entering the buildings.

(v) Supervision and Coaching

Depending on COVID-19 pandemic severity, supervision and coaching of preservice teacher have been done both onsite and online or either one of them.
Supervision can be provided in a variety of styles and settings. Direct observation of pre-service teacher in class may be used, or teaching may be observed remotely using Zoom or Google Meet. Performance feedback and evaluation have been conducted online as well.

Acknowledgments

We would like to thank Chulalongkorn University for all technoligcal supports as tools for online teaching and evaluation during COVID-19 pandemic, and thank Assoc. Prof. Wanlapa Aeungmaitrepirom for her input and suggestions for the presentation.

Phenomenon of Boredom of Online Activity in COVID-19 Outbreak Causing Dysfunctional Behavior of Teenagers for Creating Virtual Reality Classroom Prototype

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Poschanan Niramitchainont[3], Arisara Leksansern [4]

Abstract

Due to the pandemic, COVID-19, human's activities have been influenced by online platforms; however, a long use of online device to do daily activities causes boredom, especially for students who had to attend online class without face-to-face participation with teachers and classmate, this study; therefore, aimed at surveying the level of boredom of school children between 12 to 18 years old and the preferences of teacher's platforms use to convey the lesson. 399 secondary students in Bangkok metropolis attending the schools in The Secondary Educational Service Area Office Bangkok 1 were selected by simple random sampling. Three-part questionnaire had been distributed to collect the data. The research findings revealed that during quarantine (due to COVID-19 outbreak), most secondary students had been provided with online courses from schools leading to high level of boredom ($\bar{x}$ =3.67). In the matter of preferred online platform for learning, Advanced devices like Virtual Reality or Augmented Reality was the most preferable methods of conveying the lessons online with 41.4% of the respondents selected. The findings are beneficial for relevant groups of educators, scholars, and related sectors to realize the development of online teaching and learning as a proactive plan for any unexpected situation.

Keywords: boredom, COVID-19, online learning, secondary students, Virtual Reality, Augmented Reality

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Introduction

The emergence of a novel coronavirus (COVID-19) has greatly affected all human beings around the world. This emerging disease has caused changes, especially behavioral changes. This is because most people need to keep themselves in shelters, while still need to study or work from home. As a consequence, online activities are prevalent means for individuals of all genders and ages. Each person has different objectives for online activities such as work, study or entertainment.

Adolescents are emotionally and behaviorally vulnerable because they are in the stage of hormonal changes. Generally, they spend time online chatting, socializing, browsing, studying or playing games. When the COVID- 19 pandemic strikes, teenagers who are school age need to spend time online much more than before. This is due to the fact that all schools' or universities' classes need to be scheduled online. However, the repetitive online learning and online activities, without face-to- face social interaction, have caused boredom, which in turn leads to abnormal behavior of adolescents. Al-Shara (2015) investigated the factors affecting students' enjoyment in learning and teaching and found that the most important factor affecting students' enjoyment was the implementation of learning resources, whereas The lowest factor influencing students' enjoyment of learning was the teachers' teaching style. Moreover, Heckel and Ringeisen (2017) studied the enjoyment and boredom in academic online learning and found that the lack of teenagers' self-direction and the need to take online courses resulted in boredom. Similarly, the arising of boredom depends on the level of difficulty of contents of online lessons. Hawkins, Heffernan and Baker (2014) pointed that there was a positive correlation between boredom and the difficulty level of the lesson in unfavorable contexts such as online learning. It can be said that there are a number of factors contributing to boredom in adolescence, especially for academic online learning.

Information and communication technology (ICT) has significantly played a vital role in education and been used as a substantial platform for online learning and activities. However, conventional ICT- based learning platforms, both synchronous and asynchronous, with limited two- way communications and not allowing for creative and critical thinking, have also triggered boredom of teenagers. The arrival of virtual reality (VR) and augmented reality (AR) has made a different story. Since their advent, there are a number of research studies on virtual technology. Buttussi and Chittaro (2018), for instance, studied the effects of different types of virtual reality display on presence and learning in a training scenario and the results indicated the training benefits, regardless of the kind of displays used. Additionally, Lee, Hsiao and Chen (2020) explored the benefits and factors of virtual reality gameplay and it was found that the benefit factors included flow, spatial presence and relaxation. They also claimed that although virtual reality is recently popular, the adoption of VR devices is still relatively low.

Upon reviewing the literature, it has revealed that the studies of benefits of virtual reality and simulations, especially in education, together with the studies of effects of online activities causing boredom and adolescent behavioral disorders in time of COVID- 19 crisis, are still limited.

Therefore, this study aims to fill in the gaps in the literature by proposing a study to investigate the level of boredom of teenagers caused by online learning and to find out the favored online means for studying of adolescents.

Research Objectives

1. To study the boredom of online study of secondary students in Bangkok during the pandemic.
2. To survey the preferred online platforms for studying of secondary students in Bangkok.

Literature Review

1. Online Activity in COVID-19 Outbreak

The deadly and infectious disease Corona Virus also known as COVID-19 has deeply affected the global economy. This also shaken up the education sector, and this fear is likely to resonate across the education sector globally. The Covid-19 pandemic outbreak forced many schools and colleges to remain closed temporarily. Several areas are affected worldwide and there is a fear of losing this whole ongoing semester or even more in the coming future. Various schools, colleges, and universities have discontinued in-person teaching. As per the assessment of the researchers, it is uncertain to get back to normal teaching anytime soon. As social distancing is preeminent at this stage, this will have negative effects on learning opportunities. Educational units are struggling to find options to deal with this challenging situation. These circumstances make us realize that scenario planning is an urgent need for academic institutions (Rieley, 2020). The COVID-19 pandemic has triggered new ways of learning. The new normal now is a transformed concept of education with online learning at the core of this transformation

The major part of the world is in quarantine due to the serious outbreak of this global pandemic Covid-19 and therefore many cities have turned into phantom cities and its effects can be seen in schools, colleges, and universities too. The Corona Virus has made institutions go from offline mode to online mode of pedagogy. The shift from face-to-face lectures to online classes is the only possible solution. Although the COVID-19 pandemic poses a threat to education, it has also provided an opportunity to recognize online learning as an effective pedagogical method.

Online learning has a historical root in distance education. Online learning is described as access to learning experiences via the use of the Internet and considered a more recent version of distance learning. The future of online learning will continue to see exponential growth. Online learners worldwide start to recognize the importance of online learning, its role in education will only continue to rise.

Online Learning or E-Learning Rapid developments in technology have made distance education easy (McBrien, Cheng, & Jones, 2009). “Most of the terms (online learning, open learning, web- based learning, computer-mediated learning, blended learning, m-learning, for ex.) have in common the ability to use a computer connected to a network, that offers the possibility to learn from anywhere, anytime, in any rhythm, with any means” (Cojocariu, Lazar, Nedeff, & Lazar, 2014)

Online learning can be termed as a tool that can make the teaching–learning process more student-centered, more innovative, and even more flexible. Online learning is defined as “learning experiences in synchronous or asynchronous environments using different devices (e.g., mobile phones, laptops, etc.) with internet access. In these environments, students can be anywhere (independent) to learn and interact with instructors and other students”. This virus spread such online platforms are needed where (a) video conferencing with at least 40 to 50 students is possible, (b) discussions with students can be done to keep classes organic, (c) internet connections are good, (d) lectures are accessible in mobile phones also and not just laptops, (e) possibility of watching already recorded lectures, and (f) instant feedback from students can be achieved and assignments can be taken (Singh & Thurman, 2019; Basilaia, Dgebuadze, Kantaria, & Chokhonelidze, 2020).

Today, online learning has emerged as a necessary resource for students and schools all over the world. For many educational institutes, this is an entirely new way of education that they have had to adopt. Online learning is now applicable not just to learn academics but also extends to learning extracurricular activities for students as well. The demand for online learning has risen significantly, and it will continue doing so in the future. While the world of online education is undoubtedly an exciting world to be in, many students who are uncomfortable with online learning still prefer the traditional live, in-person teaching methods which they are used to. All students have unique learning styles and online learning will likely never be a one-size-fits-all type of the education solution.

There were some studies about online learning such as Parkes, Stein, and Reading (2014) in a study, students were found to be not sufficiently prepared for balancing their work, family, and social lives with their study lives in an online learning environment. Students were also found to be poorly prepared for several e-learning competencies and academic-type competencies. Also, there is a low-level preparedness among the students concerning the usage of Learning Management Systems. From a more systematic analysis, Navarro and Shoemaker (2000) found that student learning outcomes for online learners were as good as or better than traditional learners regardless of background characteristics and that the students were greatly satisfied with online learning. Rovai and Jordan (2004) examined the relationship of sense of community between traditional classroom and the blended format, and they found that students in the blended format had a stronger sense of community than students in the traditional format. In a study that compares learning outcomes for students who self-selected into the online format for a macroeconomics course, researchers found that after correcting for sample selection bias, test

scores for the online format students were four points higher than for the traditional format (Harmon & Lambrinos, 2006). In a methodologically rigorous study conducted at Ithaka (Bowen & Ithaka, 2012), students were randomly assigned to the traditional format (control) and a hybrid interactive online learning format that met once a week where students did most of the work online (treatment). The researchers found that there are comparable learning outcomes for both groups and that there was the promise of cost savings and productivity gains over time for the hybrid course. Furthermore, these learning improvement and cost saving gains are expected to increase as new tools and software for online learning are being developed and tested continually.

2. Boredom of Online Activity

It can be seen that COVID-19 outbreak has changed the human behaviors, transform the teaching and learning methods and platforms, encourage the new normal society and culture. In education context during COVID-19 outbreak, online learning has become an important tools in education, ranging from exclusive virtual learning to blended learning and all formats of hybrid learning where traditional learning settings with on-site classroom were replaced. Students in many countries including Thailand have to study via various online platforms such as Zoom, Google Classroom, Meet, Line application, Facebook, Television Channel, or other distance learning. The current online courses basically consist of reading assignments, lecture videos, homework problems and quizzes. They might be separated into short lessons but they still follow the same old linear of 4-5 months per a semester. Some schools and teachers were well-prepared while some were not ready and unplanned for the online teaching both for digital skills and online materials. Some students get bored in online classes because they have to look at a single screen for a longer duration of time and less interaction with teachers and classmates. Some students didn't have enough equipment for online learning, and even for other distance learnings (TV); have some network issues; didn't concentrate with the lesson but spent time using social network during class; played games on computer while the class went on my mobile etc. These reasons led students to the boredom for the lesson. (Rungta, 2016; Hansanali, 2021; Thaipost, 2020).

Boredom can be described by control- value theory of achievement emotions; which the perceptions of control and value are seen as antecedents to discrete emotions students experience in learning and achievement related settings. These emotions are differ- entailed along the dimensions of valence, arousal and object focus. Boredom referred to an unsuccessful attentional engagement in valued goal- congruent activities; or can be defined as a state of disengagement, negative and deactivating emotion. The boredom composed of two components such as attention and meaning; it also can be defined as momentary emotion within a given situation at a specified point of time, as well as habitual, recurring emotion typically experienced by an individual in relation to particular activities and outcomes.

In the current online education, boredom and enjoyment were the most frequently experienced achievement emotions among students. Students experienced boredom when they felt either

unable or unwilling to engage in a present online learning; or felt divergent between personal goals and a given task, or didn't have specific goals. Boredom occurred when student felt too controlled or might also be experienced when there is a lack of control over the activities because demands exceed individual capabilities. The boredom of online learning could cause the teacher's classroom management; students' negative attitudes towards subjects, student's fatigue, learning helplessness and depression; unable to use of learning strategies, and also teaching and learning involvement. (Goetz et al. , 2014; Pekrun et al. , 2010; Pekrun, 2006; Westgate & Wilson, 2018; Kruk & Zawodniak, 2020; Obergriesser & Stoeger, 2020).

There were some studies about boredom of online learning such as Heckel & Merseburg (2017) studies the relationships among enjoyment and boredom, their cognitive predictors, and outcomes in the context of online learning in higher education and assessed by means of self-report using a cross-sectional design. The results revealed that learning satisfaction was predicted by enjoyment and boredom reduced course satisfaction but does not impair competence development in the context of online learning.

A recent survey by Hong Kong Christian Service's Shamshuipo East Happy Teens Club (2021) reported that 67 percent of students in Hong Kong found online learning "boring". Not only do students struggled to engage in their online learning, around 40 percent also reported feeling "stressed". 20 percent described their remote learning experiences as "anxious-inducing" while another 20 percent felt "lonely" when studying at home. Out of the 432 primary school students surveyed, less than 20 percent rated online learning as "fun" and "interesting". The survey also identified a gap between how schools had conducted remote lessons and what the students had expected from them. Many students were disappointed by the school's requirement to turn on their video camera and wear school uniform during online lessons. Nearly 80 percent of students had hoped their schools would reduce the number of examinations scheduled during the study from home period. In reality, less than half of the surveyed students reported a decrease in school examinations. Around 30 percent of students felt they did not receive enough support from schools for their online studies. More than 25 percent cited that their homes were not a conducive environment for studying. Stephanie Yuen Kiu-yan, a registered social worker and member of Hong Kong Christian Service, recommended schools and the Education Bureau to seek the opinions of their students to better understand their expectations for online learning and transitioning back to in-person classes. Yuen also suggested schools to offer more support to students from underprivileged households by keeping the campus and its facilities open for their use during school closure.

3. Teenagers Dysfunctional Behaviour

Adolescence was a period where parents and teachers can experience an abrupt disconnect as physiological and psychological changes render them unrecognizable. During adolescence social contexts influenced adjustment and well- being outcomes. Economic status, neighborhoods, schools, peer- relations, and family processes independently and interactively impact these

outcomes. Adolescents will establish beliefs about their capabilities and potential, develop patterns of behavior around learning, and cultivate the relationships with peers and adults that impact their sense of belonging. Self- concept is a major factor of adolescent adjustment which is exhibited through their behaviors; and move toward for more appropriate behavior. Adolescent behaviors could be categorized into positive and negative, internalized and externalized behaviors. In education context, adolescent students were a challenging age group to teach and difficult for teachers support students through school. There were significant changes in the pre-frontal cortex; the area of the brain which is responsible for planning, problem- solving, assessing risk, decision- making and social interaction. These changes impacted adolescent behaviors such as engaging in risky behavior, placing undue emphasis on social rewards, and struggling to read and understand others' emotions. The adolescent students thrived best in a nurturing environment, where the importance of sleep, nutrition, exercise and self- care was recognized. Teachers should aim for a variety of instructional methods which encourage adolescent students to have the critical thinking, creative thinking, analytical thinking and system thinking. Keeping their brain active will help develop and strengthen the neural pathways that are vital for long- term learning (Starbuck, 2018; Hunter, 2018).

Currently, middle and high school students which were adolescents, spent a long whole day for study in schools and some spent extra class in tutorial schools. The school time started early in the morning. Early school start times had been shown to have a major negative impact on academic functioning including falling asleep in class, daytime sleepiness, high rates of tardiness and absences and an inability to complete homework because of falling asleep (Wahlstrom & Owens, 2017). During COVID- 19 outbreak, adolescent students had a whole day class but switched to online platforms. This led to the change of student learning behavior. Students accessed the online platforms to study anywhere through internet. This learning mode allowed greater flexibility in learning environments; and also encouraged adolescent students to manage themselves about time concerning the learning paths. Although online learning environment offered self- directed learning; but it also had a large number of negative effects such as the increase of drop- out rate, stress, loneliness, depression, less class participation, anti-social behavior, difficulties in two-way communication and students still had to use extra time to seek help from other learning platforms if they did not receive real-time learning suggestions; behavioral disengagement which led to the lower learning gains in the short- term and also associated with lower long- term academic performance. The solutions to improve online learning were encouraging learning motivations, providing instant feedback and channel for knowledge sharing and discussion with teachers and classmates (Hwang, Wang & Lai, 2020; Tawfik et al., 2017; Gil, Virgili-Goma, Garcia, & Mason, 2015; DeFalco, Baker, & D'Mello, 2014).

There were some studies about online learning and teenager's both positive and negative behavior. The study of Hwang, Wang & Lai (2020) found that online learning environment provided students with opportunities to exchange opinions with others and facilitated their self-regulated learning. Students who used the social regulation-based online learning approach had more positive online learning behaviors than the students who use the conventional self-

regulated learning approach, such as reading the supplementary materials regarding the wrongly answered questions and revising the notes; It is related to the study of

Pleau (2012) that revealed about the adolescents believe on benefits of virtual learning such as flexibility with place and time, access to schooling, access to courses when desired, and individualized study; and also reflected the disadvantages of virtual learning such as teacher access & willingness, difficulty with collaboration, and the requirement for more self - motivation. Therefore, using educational technology for adolescents should be more careful and consider the balance of technology with other activities that promote relationships, creativity and development. Excessive use could negatively impact the physical, mental, emotional and social development of adolescent students (Halupa, 2016).

Methodology

This cross-sectional survey study was designed to understand the level of boredom of secondary students who could not attend the class at schools owing to the COVID-19 outbreak. The details of the study are as following;

Population and sample group

The population of this study was 106,850 secondary students affiliating in The Secondary Educational Service Area Office Bangkok 1. The sample group was 399 secondary students in Bangkok selected by simple random sampling and calculated by Taro Yamane's formula as below;

$$n = \frac{N}{1 + Ne^2}$$

n = 106,850/1+106,850 (.05) (.05)

n = 399

Relevant theory

This study employed the concept of "trait boredom" or "boredom proneness", which is the tendency of individuals to experience boredom. The Boredom Proneness Scale (BPS) was established based on the concept of Farmer and Sundberg (1986).

Research Instrument

The instruments of this research were divided into 3 sections; personal information, boredom proneness scales on online (learning) activities, and preferred online platforms. The

inventory was developed based on the concept of “trait boredom”. 20 items of five Likert scale were established in the section of boredom. Moreover, eight online learning platforms were proposed to the respondents which included applications or websites, prepared clips, e-books and worksheets, LIVE class via online, Virtual Reality, introduced websites, Google classroom, and interaction platforms with instant feedback.

Data Analysis

Descriptive statistics was used to analyze the data such as mean score, standard deviation, percentile, frequency, and standard deviation.

Research results

The objectives of the study were to study the boredom of online study and survey the preferred online platforms for studying of secondary students in Bangkok during the pandemic. There were overall 399 respondents participating in the study and the survey results are as following;

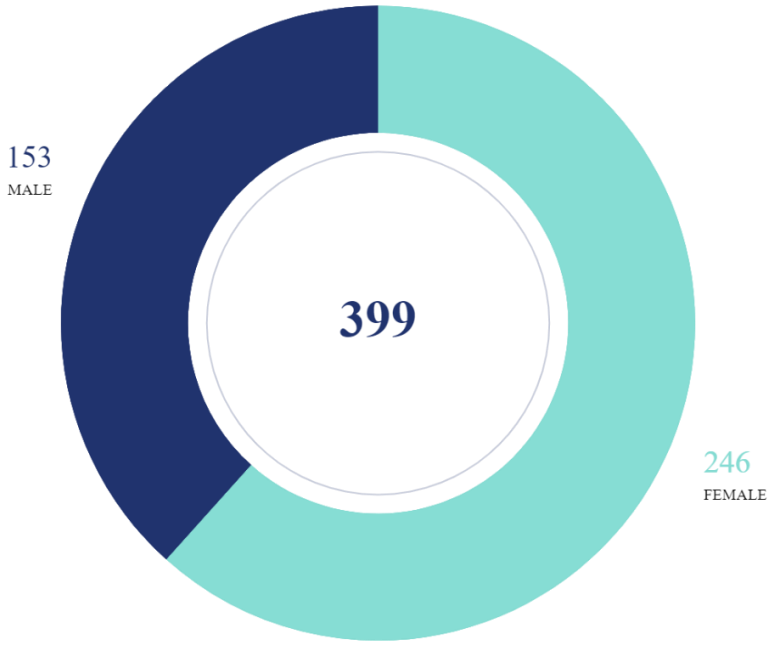

Figure1: the number of samples divided by genders

From figure 1, there were 153 secondary school boys (38%) responded the questionnaires, whereas 246 secondary school girls responded which was 62% of all.

Table 1 The level of boredom of online (learning) activities

Variable	Min	Max	Mean	SD
Boredom of online (learning) activities	2.50	4.50	3.67	.34

According to Table 1, the mean score of boredom of online (learning) activities of secondary students in Bangkok was 3.67 (high) meaning that they were quite bored with online learning, especially the online lessons set by schools. In the other word, the formal online class seemed to be low effectiveness compared to face-to-face class to motivate students to concentrate on the lessons. The highest level of boredom was for item 17 “It is so difficult for me to focus on my online activities, especially learning.” with a mean score of 3.76. In contrast, the lowest level of boredom was for item 12 “I hardly wake up with a new idea.” with a mean score of 2.76.

After the respondents completed the Boredom Proneness Scale (BPS) survey questions, they would select the platform for online learning that was believed as the most effective method to motivate their interest in online lessons. There were eight alternative platforms including;

1. Applications or websites
2. Prepared clips from instructors
3. E-books and worksheets
4. LIVE class via online platforms such as ZOOM, Google Meet, or Microsoft Teams
5. Advanced devices like Virtual Reality or Augmented Reality
6. Introduced websites such as Khan Academy
7. Google classroom or any other platform to assign and hand in work
8. Interaction platforms with instant feedback

Table 2 The preferred platforms for online (learning) activities

Platform	n	Percentage
1. Applications or websites	38	9.50
2. Prepared clips from instructors	35	8.80
3. E-books and worksheets	21	5.30
4. LIVE class via online platforms such as ZOOM, Google Meet, or Microsoft Teams	45	11.30
5. Advanced devices like Virtual Reality or Augmented Reality	166	41.60
6. Introduced websites such as Khan Academy	16	4.00
7. Google classroom or any other platform to assign and hand in work	71	17.80
8. Interaction platforms with instant feedback	7	1.80
Total	**399**	**100.00**

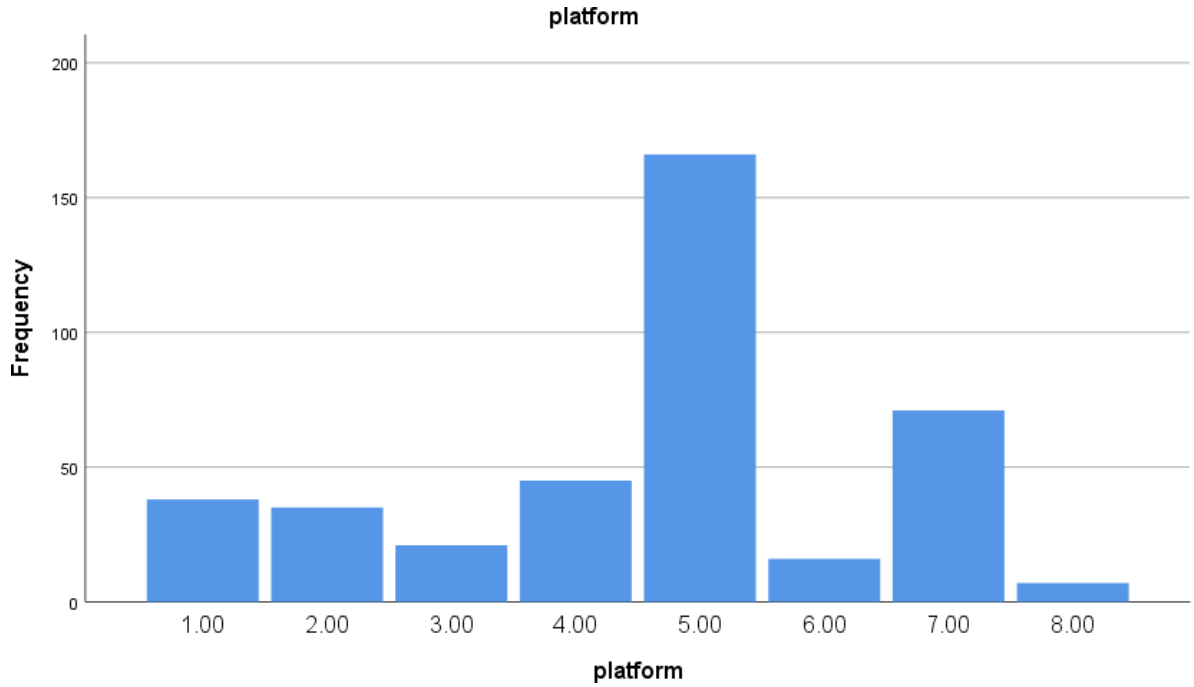

Figure4: the bar graph to represent the frequency of responses to the preferred platforms

According to table 2, it is vividly seen that platform 5, “Advanced devices like Virtual Reality or Augmented Reality”, was the most preferable methods of conveying the lessons online with 41.4% of the respondents selected. The second most preferable online platform the respondents opted was platform 7, Google classroom or any other platform to assign and hand in work which was 17.7% of all. Another preferable online platform was platform 4, “LIVE class via online platforms such as ZOOM, Google Meet, or Microsoft Teams” which was opted by 11.2% of the respondents.

On the other hand, platform 8, “Interaction platforms with instant feedback”, was the least preferable platform selected by the respondents (1.7% of the total number of the respondents).

From the data analysis, it reflects secondary students seemed quite bored with online lessons conducted by school teachers, especially during COVID-19 outbreak sine they all had to be instructed via online platforms. Online lessons prevented them from intensively concentrating on the lessons conducted at least 45 minutes per subject with a continuous subject without or a few minutes break (around 10 minutes).

However, one of the most possible ways to strengthen the concentration on the online lessons is the preferable online platforms that have enough potential to motivate secondary

students to achieve the set learning criteria. The research findings revealed that most secondary students in Bangkok require the combination of technology into the online class due to the fact that this matter would help motivate and excite them to learn via online without boredom since the boredom is one of the powerful hindrances preventing students to do most things, particularly online class set by schools.

Discussion

This research survey has reflected some significant keys of success of conveying the lessons online of school teachers in Bangkok, Thailand. Although most schools in Bangkok metropolis have been provided with the budgets for technological devices and the Internet connections, the cause of the boredom and lower learning performance still exist unless teachers, relevant personnel, and any other stakeholder have not concerned or got involved in developing teaching methods.

The discovery of the first objective of this study revealed the high level of boredom of secondary students in Bangkok, Thailand. During the first phase of the quarantine (3 months), all Thai schools provided online class for secondary students. The phenomena of boredom with online class seemed prevalent. There are various drawbacks emerging during online teaching-learning such as poor network and connectivity, lack of interaction, and one-sided learning (Hasen, 2020). These could contribute the boredom. Owing to the styles of teaching, secondary students found the quality of online lessons seemed low as they perceived face-to-face communication or having real-world interaction could be potent to motivate the students, particularly the concentration on each online lesson. Therefore, several key factors are concerned with regard to reducing students' boredom on taking online class, including quality and timely interaction between students and professors, technical support availability, structured online class modules, and modifications to accommodate conduction of practical classes (Nambiar, 2020).

As disclosed from this study, motivating students with well-structured class and interactive online platform must matter. The combination of advanced interactive technology, namely Virtual Reality (VR) and Augmented Reality (AR) were preferred by most secondary students. Some evidences reveal the positive consequence of utilizing new technologies and services for teaching and learning such as the study of Kramer et al. (2014) which researched on benefits of interactive online learning in distance education. The research revealed that online students were satisfied with the online version of combining new technologies and the e-learning environment. The satisfaction can substitute the motivation of online learning. Also, Pantelidis (2009) discovered the advantages of the use of virtual reality in education and training, which were high motivating, attracting learners, and interactive designs. Therefore, with the potential of advanced technologies like VR, the quality of teaching and learning must be enhanced.

Conclusion

Online study is currently becoming necessary channel, particularly during COVID-19 outbreak that caused lockdown in many countries. Without foreplan teaching designs, most teachers worked hard to get used to providing students with online class. However, the study had surveyed on the boredom resulted from online study set by schools and discovered that secondary students in Bangkok had high level of boredom with online class. As aforementioned, most felt they could not concentrate on the lesson well since they were easily distracted from neighborhood surroundings. Also, online class set by school teachers seemed farther from motivating them to learn online. Hence, advanced platforms such as Virtual Reality was preferred by secondary students as found from this research.

This challenging could be made possible if innovators have realized the advantages of designing lesson into virtual reality. The research findings are beneficial for educators and developers who are working in the education fields or related. The high level of boredom of secondary students ignites the idea of re-designing or improving the teaching methods to motivate students and enhance the academic achievement. For the developers, virtual reality is one of the innovative tools for education which can extend the idea of inventing new ways of learning. Additionally, since this research was a survey, researchers in related fields can adopt the findings from this research to fulfil the gap of knowledge. However, the further research methodology could be more varied and represent the holistic view of boredom with online learning.

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Appendix

Boredom proneness in online lesson conducted by school

The items for Boredom proneness in online activities

1. I always find myself worrying about other thing when I am learning online.
2. Time of online lesson seems to be passing slowly.
3. During the lesson, I feel I am trapped in situations where I have to do meaningless things.
4. All lessons and assignments from online bore me tremendously.
5. I am an individual who avoid having too many plans during the quarantine.
6. I find it so difficult to entertain myself when I have a lesson online.
7. When I wake up in the morning, I find things are repetitive and monotonous, especially when I have an online class.
8. I am rarely excited about studying online.
9. Much of the time during online class, I just sit in front of the screen and nothing comes to my mind.
10. It takes more stimulation to get me interested in online lessons.
11. I am not good at waiting something online patiently.
12. I hardly wake up with a new idea.
13. I never hope to achieve the good score on online lesson.
14. I have a negative idea towards learning online.
15. I feel that I am working below my ability during online class.
16. Among my friends, I am the one who keeps doing something the shortest.
17. It is so difficult for me to focus on my online activities, especially learning.
18. During the quarantine, I find online activities bore me and make me idle.
19. It takes a lot of change and variety to keep me interested in online lesson.
20. Learning online is quite monotonous and tiresome.

Enabling Online Collaboration in Problem-Based Learning During COVID-19: Reflection from Human-Computer Interaction Course

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Abstract

COVID-19 pandemics caused substantial challenges in online learning, one of them is to maintain the collaboration remotely in the class. Human-Computer Interaction Course at IPB University is designed as problem-based learning, where groups of students solve a real-world problem through their design. In face-to-face format, the students will work closely as a group, having a lot of brainstorming sessions which utilize standard tools like pen, paper, and sticky notes, which substantially contribute to the learning outcome achievement. In this chapter, we aim to provide our journey to transform the class from face-to-face to online learning, while keeping collaboration in mind. We also provide the ways we eventually conducted the class, the student feedback, the challenge we have, and the best practice we learn in the process. We hope this chapter can spark a discussion and further nurture the way online collaboration in class can happen effectively to engage the students in their learning journey.

Main topics

This chapter will be organized into 5 sections. In the first sections, we provide the introduction of the Human-Computer Interaction (HCI) course at IPB University and the learning process before the COVID-19 pandemic. In the second section, we will talk about the process we have when transforming from face-to-face to online learning, and how the community can help us as the lecturer in this process. In the third section, we provide the details of the online learning process in our course to enable collaboration, and in the fourth section we provide the reflections from the attempt. Lastly, we close with the last chapter about the future works we can do to improve online collaboration which is essential in problem-based learning.

Section 1. Introduction to Human-Computer Interaction (HCI) Course for Undergraduate Student and The Learning Process Before the COVID-19

1.1 Course Description

The Human-Computer Interaction (class) is a mandatory class in the Computer Science Undergraduate Program and also offered as a supporting course and information system minor course for students in a non-CS major without a prerequisite. The learning outcome

of the course is for the students to be able (competent/credible) to analyze, design, develop, evaluate / test, and communicate a form of interaction between humans and computers in limited scope. The course was designed as problem-based learning with 2 credits for lecture and 1 credit for practicum. The lecture is designed to develop a core understanding of the HCI concept and design process through case studies and discussion, while the practicum is designed to give scaffolding through facilitation, mentorship, and guidance to apply their understanding to the problem. The course is taught by three lecturers and assisted by several teaching assistants. The class size is varied between 100 to 150 students, around a quarter of them are from non-computer science programs.

2. Problem-Based Learning Through Reimagine Experience Challenge

The course is delivered using problem-based learning approaches (Wood 2003; Koutsabasis and Vosinakis 2012). Group of 3-4 students working together to create new interaction to solve real-world problems in the given problem area. General design-brief is given to the student in the first week. Students then work for 12 weeks to create the solution using a well-established interaction design framework. Finally, they present their solution at week 14. We adopt the Double Diamond design methodology (designcouncil.org.uk) as a guideline to help students solve the problem in the problem-based learning, which consists of the following phases: discover-design-develop-deliver. The problem-based learning approach requires a lot of collaboration between team members and between team and their targeted user. The typical situation in our classes involves a lot of group discussion, brainstorming, in-campus user research, sketching, and a lot of sticky notes.

3. A Community of Practice to Support Learning and Nurturing Professionalism

We also provide the students with access to engage in the HCI and user experience (UX) community of practices on our campus, which is the IPB University ACM SIGCHI Student Chapter. The students can join the community to engage with fellow students, alumni, and professional networks in related fields (user experience, product design, interaction design) who graduated from IPB University. We aim for better exposure to the HCI and UX practitioner community for the students, which is in line with one of the principles of the Computing Curricula 2020 (Impagliazzo and Pears 2018), and allow the sharing of the best practices in the industry to the students. Their activities include workshops, hands-on lab, seminar, talks, and competition.

Fig. 1. The activities of the IPB University ACM SIGCHI Chapter as a community of practice between students and professionals.

Section 2. Transformation Process from Face-to-Face to Online Learning

When COVID-19 spreads in Indonesia, one of the Government policies is to bring the university students back to their respective home and have the class conducted online. These abrupt changes force us to adjust the learning process in the course to still achieve the learning outcome, although with a lot of technical challenges present. There are several problems in our mind back then that we considered when crafting online learning, which includes (a) how to transform collaborative activities (which relies on a lot of physical objects and tools) to an online format? (b) How to make the collaboration engaging? (c) How to manage the quality of students' work and learning outcome achievement?

We also consider several things that can influence online learning. For example, most of the students might not have any previous experience in doing complex online collaboration beforehand. They also might not have the equipment or internet access to conduct the collaboration. And also, although we have conducted several courses online before, this is the first time we teach the HCI course in an online format. To help us design a good online course experience, we connect with the HCI communities.

HCI education is always a major focus of both the academic and professional community. The effort to improve the quality of education is led by the Association for Computing Machinery, Special Interest Group on Computer-Human Interaction (ACM SIGCHI). As the pandemic hit not only Indonesia but also the majority of the countries, the same problem arose in the worldwide community. This caused a lot of discussion in the SIGCHI forum, and eventually some initiative to discuss and share the best practices of teaching HCI online was initiated. German ACM SIGCHI Chapter created an online panel discussion, titled ‘how to make remote HCI teaching useful, engaging and exciting?[1]’. EduCHI Living Curriculum also creates an ‘EduCHI: Teaching HCI Online’ virtual event that enables the community to share various pedagogical practices and tools that can support HCI education in a pandemic situation. We also reach our alumni to discuss our draft of the teaching plan to get feedback from them related to the best practice of online

[1] amp.ubicomp.net/hciedu

collaboration in an industry that can be applied in this condition (Fig. 2). As the online collaboration is nurturing in Indonesia, we saw a potential to implement similar approach in class to provide stud

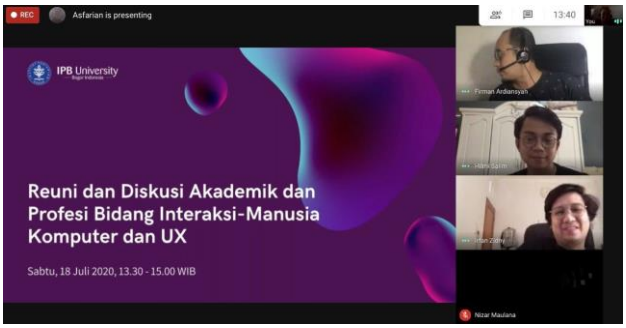

Fig. 2. Online discussion with alumni to gain feedback related to the online learning.

The presence of the community of practice in HCI (St-Cyr et al. 2018) is really helpful to ensure rapid dissemination of best practices between practitioners. From the sharing session from the community, we got a lot of input regarding the pedagogical best practices and tools for HCI online education. Based on these inputs, we finalise the online lesson plan for the HCI class.

Section 3. Online Collaboration in HCI Course

3.1 Platform and Tools Preparation

We utilise the facility provided by IPB University, combined with other products to support online collaboration. The teaching team also research and compare the collaboration tools which has the potential to be used in the course. We used various tools, commonly used in industry, which provide free access to their services for students or educational purposes (Tabel 1). Most of the tools related to HCI education are inspired by the community that explained in the previous section.

Table 1. Tools used in course and their role in learning

Tools	Role in Learning
Moodle-powered Learning Management System	Serve as primary resource page for students: the main portal to access every course materials and activities
Google Sites	Alternative for wiki-style collaboration platform in course activity
Zoom and Google Meet	Enabling a synchronous session and discussion, and provides video recording; Also used as remote qualitative user research tools
WhatsApp and LINE	Serve as communication channel to discuss or

	information sharing in textual format
Mural	Supporting online brainstorming and discussion; Serves as a virtual whiteboard, table, or paper; Good alternative to sticky notes
Figma	Supporting online collaboration in creating a high-fidelity prototype
Maze Design	Enabling remote quantitative usability testing platform

Note: Most licenses are freely available for students or education purposes with limited functionality. Each group Mural and Figma workspace is accessible by both lecturers and teaching assistants.

In summary, during the pandemic, lectures and practicum are conducted online 14 times each. Learning methods can be synchronous or asynchronous under those listed in the online learning plan document. These activities can include online lectures synchronously through video conferencing applications, independent activities in the form of literature review, program code collection, quiz work, storing materials in video or audio, etc., following online learning activities. Synchronous sessions through video conferencing are held in the 2nd, 6th, 10th, 12th, and 14th weeks where discussions and questions and answers on the material take place. Students who cannot participate in activities due to limited access are expected to report to the course coordinator.

We prepare a landing page (Fig. 3) to introduce the 5 problem design briefs: Reimagine Bogor Botanical Garden, Reimagine IPB University, Reimagine GLAM: Galleries, Libraries, Archives, and Museums, Reimagine Personal Health and Reimagine Design in Pandemic. Lecturer selected the topics based on the previous/current work of the lecturers. We provide illustrations, possible ideas, and previous works that have been done in that problem area, either created by previous students, IPB lecturer, or products. We introduce each design brief to the students in the first week of the practicum session, and the student group can choose which problem they want to focus on.

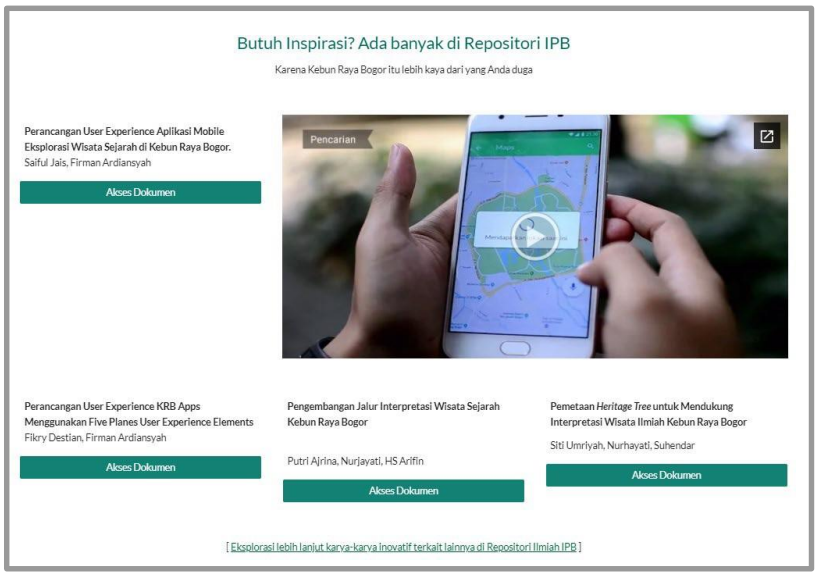

Fig. 3. Example landing page of the reimagine experience challenge which depicted previous works in IPB University in relation to the challenge.

3.2 Assessment and Acknowledgement of Prior Knowledge/Experience in HCI

The assessment of HCI courses originally consists of three components: Lesson Activity (Quiz, Exam), Project (Prototype, Report, and Presentation), Peer Assessment. The final grade is the cumulative value of the following components, with a proportion presented in Table 2.

Table 2. Proportion of each component in HCI class

Components	Proportion
Lesson activities: Midterm, Final term, quizzes etc.	60%
Practicum activities: Project	30%
Involvement in Online Lectures: Reflection Form, Discussion	10%

To help students cope with their own circumstances caused by pandemic (e.g. economic problem, connection and device issues), we also implement a prior-knowledge recognition (Cooper and Harris 2013) in the course. This also inline with the Government policy of Merdeka Belajar Kampus Merdeka (Freedom to Learn, Independent Campus) which recognizes students' activity outside the conventional course system as a part of their learning credits. This policy is a flagship program from the Indonesia Government to transform higher education system in Indonesia

In this HCI course, we implement the mini version of it, called Merdeka Learning Points, which allows student involvement outside of the course activities (but are related to HCI

courses) to be recognized in the learning process. Students can propose their completed activities through the form available at the LMS, verified by the course team. The maximum total percentage that can be recognized is 25% as a substitute for lesson activity. The activities and their respective points that can be given to the students are presented in Table. 3.

Table 3. Type of activities that can be recognize in prior-knowledge recognition system

Activities	Points*
Achievement (Winner 1 - 3) International Level in HCI / UX Related Fields	15
Achievement (Winner 1 - 3) national Level in HCI / UX Related Fields	10
Participation in International Level Competitions in HCI / UX Related Fields	8
Participation in National Level Competitions in HCI / UX Related Fields	5
Completing an online course	10
Participation in Meetups with speakers from abroad	2
Participation in Meetups with speakers from within the country.	1
Digital Applications or Products Participated in the Incubation Program / Business Plan Training	10
Membership in Profession / Community Associations in the field of HCI / UX	5

*Weights per activity

3.3 Brainstorming via Mural

Mural allows groups to have a live brainstorming session. Students use mural templates created by lecturer as guidelines for them to conduct secondary research where they are asked to summarize and present found insights by reviewing several works of literature or similar applications related to the chosen topic. Students were also asked to prioritize volume over value to encourage them to find as many insights as possible while researching. From the secondary research, they found what kind of opportunities can be applied to their idea that hasn't been found or implemented in any existing products. The research process was also supported by discussion sessions using google meet where groups discuss selecting which of the found opportunities needs to be prioritized by considering the effort and user value to it.

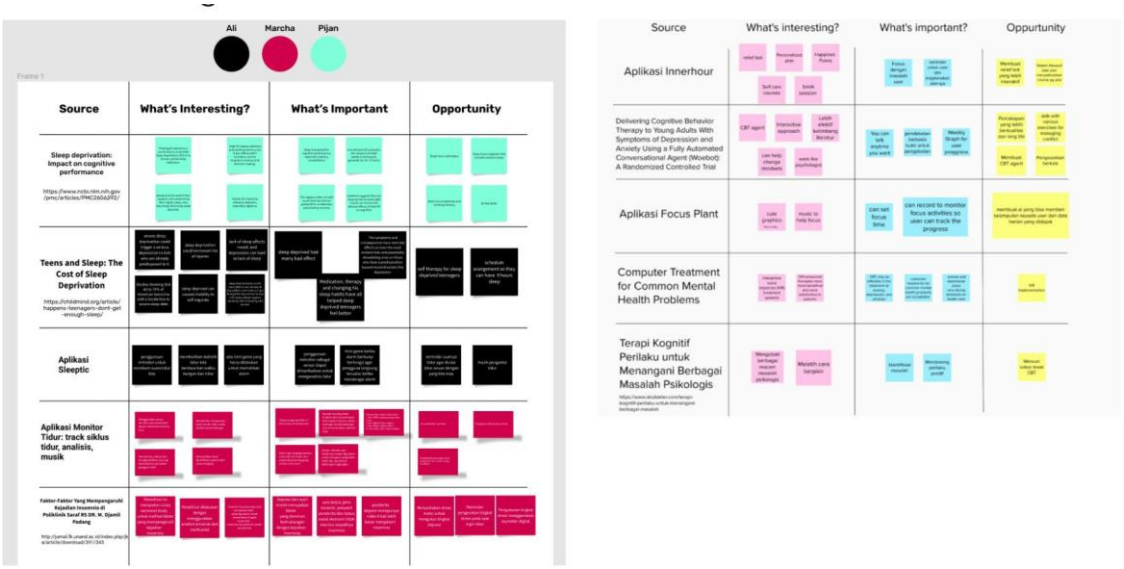

Fig. 4. Example of utilisation of Mural as a student collaboration platform for brainstorming and discussion..

3.4. Collaborative Prototyping using Figma

Figma has features such as real-time collaboration and prototyping, it allows group members to make their project's prototype and see other's work in real-time. Figma also has a community feature which is a public space to share live design files. The practicum facilitator uses this feature to create a template file with pages and examples that acts as guidelines for the project's workflow where groups can then duplicate. After having a set list of selected opportunities from previous brainstorm sessions using Mural, groups start by sketching out their interface screens on paper. These are often called paper wireframes that act as the skeleton of the interface. This is also where groups first found the tangibility of their product and start to nominate which of the insights needs to be in the scope of their project. Group then started to use Figma to make low wireframes, it usually included the basic content and simple user interface elements with white and black schemes. Then it progresses to medium-fidelity wireframes where it contains more realistic user interface components and added aesthetic details with simple colour schemes such as shades of grey. The Practicum facilitator was also monitoring their project progress through the group's Figma and then gave aid or insight if needed. All of these processes were synchronously conducted with group's discussion using google meet or other video conferencing tool.

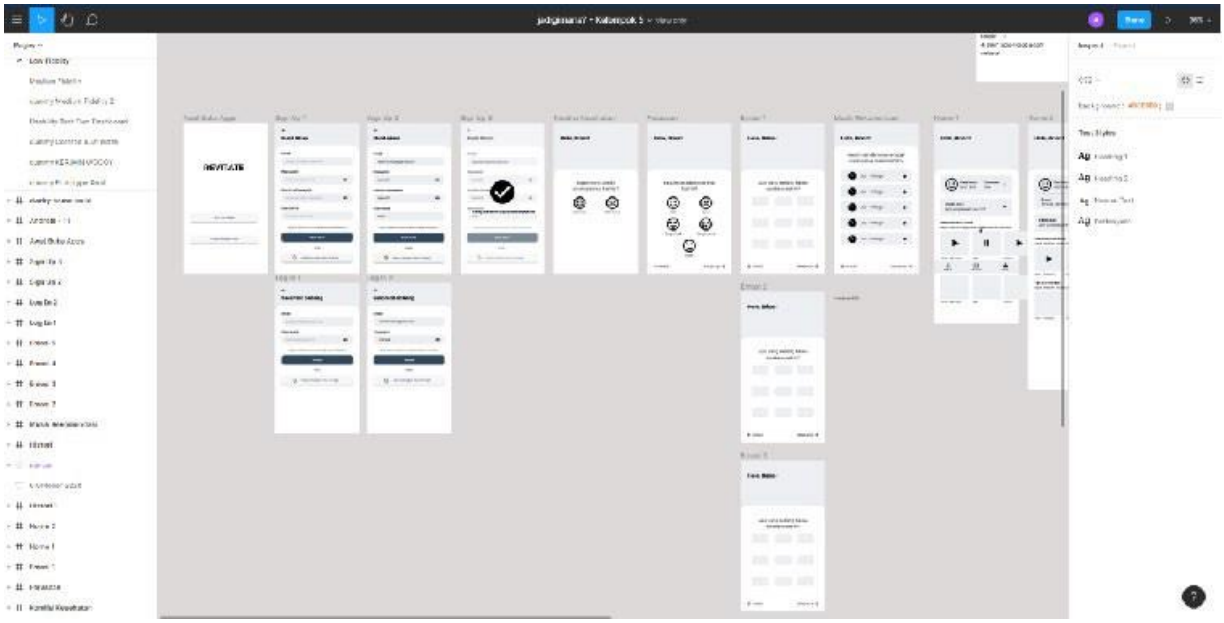

Fig. 5. Example of utilisation of Figma as a student collaboration platform to prototyping their design.

3.5. Peer Feedback through Social Media

Peer feedback (Liu and Carless 2006) is a part of the HCI course. In online format, the peer feedback is enabled by encouraging students to share their works online and have them giving feedback to their peers. In Fig. 6., one group of students share their concept through video, and other students give them feedback in the comments. The group is then compiles the feedback and use it as an input to revise their works.

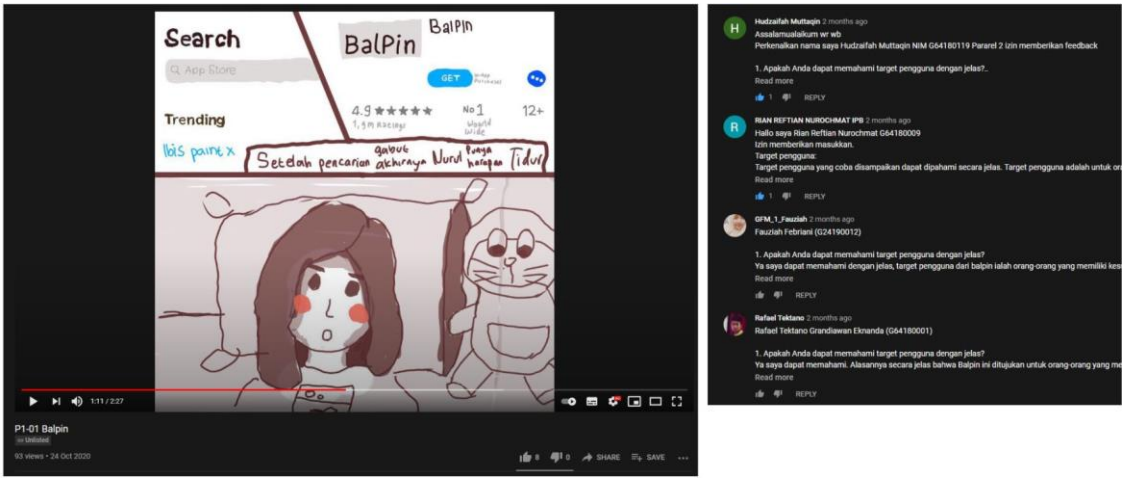

Fig. 6. Example of peer feedback through YouTube video by the students..

3.6. Selected Students Works

In this subsection, we present two of the student works. These two works are then submitted as a poster presentation at the Asian CHI Symposium 2021 and already presented and currently under publication process in the ACM Digital Library:

Design Concept: Get Comfortable Sleep Using Ambient Experience with Smart Pillow. This study aims to create a smart pillow design concept to help sleep-deprived sufferers get a better sleep experience. From the design process, we create a smart pillow capable of creating an ambient experience to help sleep-deprived sufferers through four interactions: lullaby music player, alarm, temperature control, and sleep data recapitulation (Ammarullah *et al*. 2021).

CURHAT: Telling Your Story to a Multimodal Conversation Bot to Alleviate the Stress Caused by Pandemic Fatigue. Their work aims to generate a design concept of a multimodal conversation bot to help people who have difficulty confiding in others or their family, especially during the Covid-19 pandemic. They generate a multimodal conversation bot that will listen and respond to user stories to alleviate the stress caused by pandemic (pandemic fatigue). They present three main interaction modes of conversation: chat-based, voice-based, and holographic avatar (Putra *et al*. 2021).

Section 4. Reflections

At the end of the course, we capture the feedback from students, lecturers, and teaching assistants, and reflect on it to evaluate the online course design. Students feedback was gathered using an online questionnaire. The Quantitative data indicate mid-high overall satisfaction for online learning (Fig. 7.). However, glance to the lower satisfaction indicates some people still have difficulties by doing online collaboration; Either the difficulties with the internet access or not adjusted yet to the online format. More in-depth analysis required.

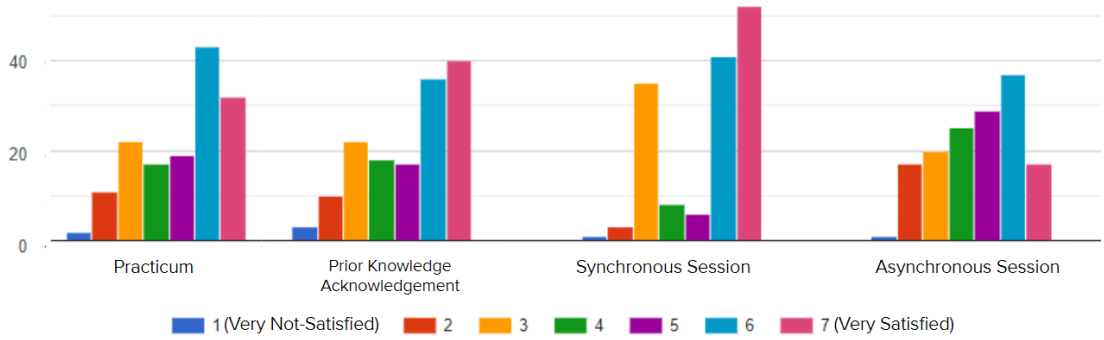

Fig. 7. The summary of student feedback.

From the lecturers and teaching assistants perspective, which we gather in the post-course meeting, we conclude that online collaboration in online learning demands good engagement between students and facilitators. The limited numbers of facilitators (9 people) are not enough to engage with the student body of 159 students. As a lot of courses are moving online, without enough time to adjust, the transformation process puts a heavy

burden on both lecturer and facilitators who also have other academic activities. The online collaboration also put high demands on adequate infrastructure, devices, and access on the students' side. This raise questions about how to maintain inclusivity in learning? The utilisation of unfamiliar tools also demands scaffolding and guidance for the first-timer students. This is true for both computer science and non-computer science students who need more guidance or training to use the platform well. We add some live tutorial sessions eventually, but the students need time to adjust to the new interaction in learning.

We received a lot of submissions for prior knowledge recognition. Some students said that this helps them to be more active in gaining experience outside campus; It also has potential to serve as alternative activities for students with the lack of access to heavily synchronous collaboration sessions which demand stable internet connection. In total, we accept 187 submissions for prior knowledge recognition. This indicates a strong interest of students for this kind of activity in learning. Further feedback and data in relation to this activity will be published in other works.

Table 4. Accepted submission to the prior knowledge recognition

Activity	Submission
Achievement or participation in HCI/UX-related competition	19
Related online course completion	137
Conference/Meetup/Webinar/Talks	22
Application or Product Released or Submitted to Entrepreneurship Training	4
Membership activity in HCI/UX professional association	5
Total submitted	187

Section 5. Future Works

Based on reflections and feedback, in the future, we will work on several aspects to improve the online learning experience. Firstly, the enrichment materials about working with specific user groups (marginalised, disabled, elderly, farmers, etc.). Some student groups have a strong interest in this user group (Asfarian et al. 2020), but the current syllabus and course resources haven’t included in-depth case studies on this area. Secondly, providing a richer method bank and case studies repository. Provide a collection of method and case studies application that can give the students insight into the why and how of the design method. This will allow students to choose more variation of method and technique. This also can support them in mastering the course material. Thirdly, implementing better analytics and research to measure student performance and

engagement. A better way to capture students' interaction is needed, especially on the off-LMS platform. The data measured can be very useful feedback for us to see the student condition and impact of the learning methods on students' engagement and performance. Fourthly, an alternative method of learning for students with limited connectivity. We are still gathering input regarding how to conduct the problem-based learning in limited connectivity conditions. And lastly, as the accepted submission to the prior-knowledge recognition shows huge interest from students, we will further research this to explore this treatment and their impact to learning outcome fulfillment.

Conclusion

In this chapter, we have presented our journey to transform HCI courses from face-to-face to online format. There are several key takeaways that can be concluded from this journey, that we hope can be applicable for other courses. Connecting with the academic (and professional) community is beneficial to help us design a better course. The community of practices really help us, and other HCI lecturers, by disseminating best practices and experience from people who have it to the people who are just starting their journey. If such a community does not exist yet in your course subject, it's probably going to be a good idea to establish one. Our experience shows that online collaboration is feasible with the currently accessible tools. However, giving a student a resource and scaffolding to learn and adjust with the tools is necessary. The experience of having online collaboration also introduce students to remote working culture in Indonesia technology company industry and can serve as real experience for them in campus. The reflections of this transformation journey also open up new opportunities that we will explore in the future research.

Acknowledgments

We want to thank IPB University for their support for us presenting this topic at The Annual Meeting of Asia and ASEAN Center for Educational Research which was held by Asian & ASEAN Center for Educational Research, Faculty of Education, Chiba University, Japan, on 8-14 February 2021.

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Learning Process at Udayana University during the Covid 19 Pandemic

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Abstract

The learning process at Udayana University changed in early 2020 due to the Covid 19 pandemic that occurred in Bali and even around the world. The COVID-19 pandemic situation has also had an impact on the repatriation of foreign students who are carrying out studies at Udayana University. The Indonesian government issued a Ministerial Regulation on Distance Education (PJJ), courses are given online to continue the learning process. The Indonesian government states that distance education is a 'new normal' in the learning process to deal with the Covid-19 pandemic. PJJ is a solution to solve the problem of limited space and facilities in implementing physical distancing. To reduce the spread of the Covid 19 Pandemic, activities outside the home are limited so that the learning process that was originally given face-to-face in class directly becomes a learning process from home which is carried out online for both local and foreign students.

In its implementation, the entire Udayana academic community faces challenges and problems. The entire academic community of Udayana University has adapted by conducting training and capacity building for lecturers to improve their ability to create online learning materials. Udayana University has prepared an online learning platform for PJJ with OASE and WebEx. Due to limited internet access, various platforms are also used by lecturers and students in carrying out the learning process such as WhatsApp, email and Google. The government collaborates with telecommunications providers to provide free or low-cost internet access for lecturers and students. Practical lessons also cannot be done optimally; practicum can be done in a very limited number.

To maintain the quality of the learning process, monitoring, evaluation and coaching of online courses must be done regularly. According to Aris Junaidi, the Director of Learning and Student Affairs, indicators of quality assurance of online courses include institutional support, learning activities, course development processes, support for lecturers and students as well as assessment and evaluation.

Main topic

From late 2019 to early 2020 the coronavirus outbreak has shocked the world. This virus infects almost the entire world as shown in Fig 1. WHO stated that the world was entering into a global emergency known as the Covid 19 pandemic. The number of victims exposed to the corona virus reached thousands of people. The Indonesian government has

issued a disaster emergency status since February 29, 2020. Steps taken by the government to be able to resolve this extraordinary case is by socializing Social Distancing. This concept explains that in order to reduce or even break the chain of Covid-19 infection, one must maintain a safe distance from other humans of at least 2 meters, and not make direct contact with other people and avoid mass gatherings (Dana Riksa Buana, 2020).

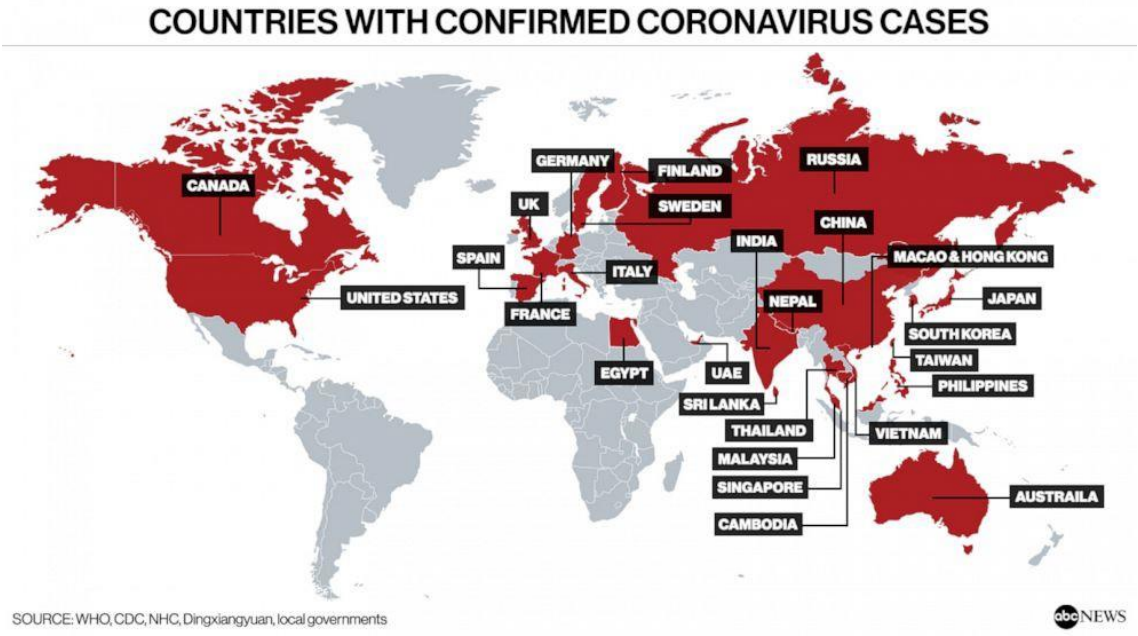

Fig. 1 COVID-19 pandemic around the world

Udayana University academics responded to this situation by staying at home. So that the entire learning process and campus activities are carried out from home which is known as Work from Home (WFH). With this provision, the entire academic community of Udayana University faces challenges and problems. The learning process, which was originally carried out face to face, became virtual. To be able to carry out the learning process virtually not all lecturers have teaching materials that will be used to teach online. The Rector of Udayana University immediately instructed all Udayana University academics to adapt by conducting training and capacity building for lecturers to improve their ability to create online learning materials.

Udayana University has 13 faculties with 4 diplomas, 48 undergraduate studies, 19 medical specialist study programs, 8 profession study programs, 26 Master study programs and 12 doctoral study programs which are gradually developing learning materials in the form of online text books, PPT, Vidio using YouTube and website. Udayana University has prepared an online learning platform for PJJ with OASE and Webex as shown in Fig 2. Due to limited internet access, various platforms are also used by lecturers and students in carrying out the learning process such as WhatsApp, email and Google. The government collaborates with telecommunications providers to provide free or low-cost internet access for lecturers and students.

Fig 2. Online learning by WebEx

Practical lessons can not be done optimally, practicum can only be done in a very limited number. Lecturers and laboratory technicians develop the practical module using video while students report their practical results by recording in video form as shown in Fig 3. Students learn more with independent assignments both in individual reports and in the results of group discussions. The lecturer burden to check student assignments is greater so that more time is needed. Presentations can be done live via WebEx but due to the up and down internet signal constraints, the learning process is not smooth because sometimes the sound is sometimes lost. This situation was addressed by recording student presentations which were then sent to the lecturer.

Gig. 3 Practical guide video, https://www.youtube.com/watch?v=BcGTbamur6I

This problem also occurs in the learning process of foreign students. Foreign students who are currently studying at Udayana University must immediately return to their respective countries due to government policies. Furthermore, the learning process is carried out online. This online learning system causes a decrease in the number of foreign students studying at Udayana University in the following semester as shown in Fig 4. This is because foreign students tend to be able to visit Bali directly and conduct face-to-face studies.

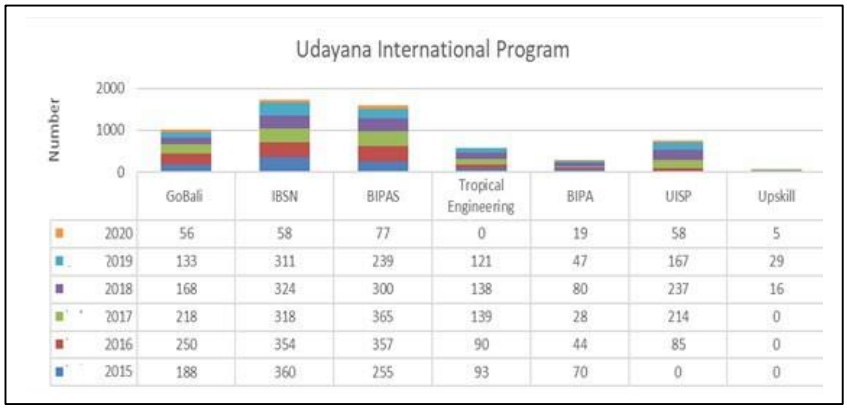

Fig 4. Number of International students

Another problem that arises in the learning process with foreign students in their respective countries is adjusting class schedules due to the 12 hour time difference between Indonesia and European countries, so learning materials must be provided via email. This causes students to feel bored and the learning material becomes unattractive. The lecturers' explanation was not maximally acceptable to students and sometimes even miss understanding. Student response is reduced and the learning process become not interactive.

According to Aris Junaidi, the Director of Learning and Student Affairs, to maintain the quality of the learning process, monitoring, evaluation and coaching of online courses must be done regularly. Several indicators of quality assurance of online courses include institutional support, learning activities, course development processes, support for lecturers and students and assessment and evaluation. Quality assurance in the implementation of online learning includes the preparation of quality teaching materials and passes internal quality assurance, material quality and moderation of discussions to be able to stimulate creativity and activity of students in the online learning process. For the quality of the assignments given to students, it must also be relevant, problem-based, argumentative, contextual, challenging, humanist, conversational and communicative and the quality of the tests given must be relevant and in accordance with the principles of objective tests.

To maintain the quality of the learning process, Udayana University strives to improve the quality of the internet signal so that it is stable and easily accessible by lecturers and students. Class duration is added by agreement between lecturers and students. Class arrangements and class schedules sometimes need to be adjust based on mutual agreement between lecturers and students. If possible, the number of students in one class should be reduced to improve the quality of learning. Lecturers are required to continue to improve the quality of teaching materials that will be given to students. Additional explanations are prepared and given before the class starts, both in the form of video and text. Lecturers are given incentives to make better teaching materials. Meanwhile, students are given a free quota to be used in the learning process. Foreign students who are abroad can use the ZOOM platform which is more stable but the duration that can be used is very limited. It is also hoped that student feed backs can be used to evaluate the learning process so that the learning process in the future can be better.

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Beyond Infrastructure: Understanding Teachers' Conceptions of Student Workload in the Teaching of Science During the CoVid-19 Pandemic

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Abstract

One of the most identifiable changes in the teaching-learning process brought about by the pandemic is the change of modality from the usual face-to-face conduct of lessons into the adoption of distance learning. This paper identifies the two basic requirements of this shift that include infrastructure-related requirements and human capital requirements. Focusing on human capital requirement particularly on teachers, the study employed a phenomenographic approach to understand practicing science teachers' conception of student workload (SW) in the current context of the pandemic. Data used in the analyses include voiced and non-voiced interviews, institutional memo's, course syllabi, and lesson plans. A total of 15 science teachers served as participants of the study. Results showed that teachers essentially consider the change as a technical shift with an inherent focus on the conversion of modality in terms of process and insfrastructure requirements. Essentially, it would appear that the teachers are teaching online with a fixed face-to-face mindset. In terms of their conceptions of student workload, the dominant pre-pandemic conception is *SW as equated to contact time* while their dominant in-pandemic conception is *SW as translated contact time*. As a result of considering the change as a technical shift, there was very little change in the syllabi from the pre-pandemic to the in-pandemic modality of teaching. Moreover, teachers appear to compensate for the perceived loss of experiential learning opportunities as a result of the change in modality resulting to an increase in the students' requirements and deliverables. Implications to policy and practice are also discussed.

Keywords: Science Teaching, Teachers'Conceptions, Student Workload

Introduction

The past two years have been characterized by an unprecedented change in almost all major aspects of society as a result of the Covid-19 pandemic. Among those greatly impacted are academic and learning institutions that include both formal and informal settings. The urgent need to reduce transmission of SARS-Cov-2 through limiting proximity and human physical contact inevitably forced the usual face-to-face conduct of classes in schools and universities to morph towards distance education through online or module-based learning (Lily et al., 2020). While distance and online

education has been in existence prior to this pandemic, the percentage of individuals and intutions offering this modality constitute a small number of the global schooling population (Poirier and Feldman, 2005). Moreover, distance and online mode of instructional delivery is largely viewed as complementary and supplementary to face-to-face instruction.

There is no certainty until when the current arrangements associated with teaching and learning through online distance education will continue to be the modality of choice. Based on the current trajectory of how different countries are addressing the pandemic, it appears that online distance learning will stay and its role is increasingly progressing from being an alternative to being the main modality of instruction. The adoption of this modality and its consequent implementation differs extensively as affected by the availability of resources, nature of the discipline, context of implementation, and policy direction among others. However, regardless of these differences, both adoption and adaptation of online distance learning will have its distinct requirements and conditions to ensure continuity and quality of instruction (Bozkurt and Sharma, 2019).

Requirements in Adopting Online Distance Learning

In the process of adapting to these massive changes, learning institutions are forced to address multiple demands to re-align their institutional resources (Davis, Little, and Stewart, 2008). These demands or requirements can be generally categorized into two: infrastructure-related and non-infrastructure related. *Infrastructure-related requirements (IRR)* refer to ICT, digital-based, and other physical infrastructures. Examples of these requirements cover internet connectivity, electronic learning gadgets such as computers and tablets, learning management and conferencing platforms for virtual classes, and physical structures for the development and deployment of content such as green rooms, multimedia studios, as well as servers and digital repository storage structures among others. IRRs are usually the first types of requirements that are addressed because of its conspicous and concrete nature. *Non-infrastructure-related requirements* (NIRR) refer to the human capital, systemic processes, and institutional practices associated with the shift in modality. For example, conceptions and paradigmatic orientation of administrators, teachers, and students have to be considered as part of the change. Changes associated with student admission, promotion, migration, retention, and graduation will have to be revisited. This is also true for the teaching-learning processes that may include how contents are taught, how skills and dispositional targets are developed, and how students are assessed.

This paper zeroes in on one of the non-infrastructure-related requirements particularly on human capital with teachers as the primary focus as they are essential and

central in carrying out the teaching-learning process. Specifically, the study aims to provide insights on teachers' conception and understanding of student workload and how this translates in the teaching of science given the unprecedented scale of shift in the modality of instruction.

Student Workload

The concept of student workload is largely based around time for study. Essentialy, it underscores the amount of time that may be deemed reasonably sufficient for a learner to satisfactorily and fully comply with all curricular requirements and deliverables. It refers to the time the student needs for study vis-a-vis what is indicated in the curriculum, and the volume or amount of work along with its difficulty level (Karjalainen, Alha, & Jutila 2006). Student workload may also be viewed in terms of the time needed for contact and non-contact study, and may be influenced by a number of factors that include the type and timing of assessments, the institutional factors such as teaching and resources, and student characteristics such as ability, motivation and effort. In terms of curricular development, implementation and assessment, student workload can be expressed and used as an objective measure for an average student to satisfactorily comply with curricular requiremetns or as a subjective measure for a particular student or group of students to do the same. It can also be expressed for a particular unit or for a combination of units to see the cumulative impact on students who are enrolled to multiple units at a time (Bowyer, 2012).

The consideration and analysis of student workload offers a number of benefits. In terms of program study assessment, analysis of student workload can provide useful insights for consequent improvement such as 1) the overall number of hours allocation, 2) semestral or quarterly overview of hours distribution, 3) subjects or course workload underloading, 4) subjects or courses workload overloading, and 5) redundancies or over-emphasis and duplication of course requirements. Student workload is also considered as the currency of degree equivalency as it provides an objective measure of curricular demands. As a consequence, student workload also lends its affordance for program cross-border crediting and internationalization (Knight, 2012).

Methodology

The study adopts an interpretivist paradigm employing phenomenography. This approach was deemed appropriate since the primary aim of the inquiry is to identify the differences and similarities in the science teachers' conceptions of student workload and how these conceptions translate to actual instructional practice (Linder and Marshall, 2003). The main criterion of heterogeneity of participants is the level taught with five science teachers participants teaching in junior high school (JHS: Grades 7-10), five in

senior high school (SHS: Grades 11-12), and another five teaching undergraduate levels (UGL: Years 1 and 2) for a total of fifteen science teachers. Teacher-participants from junior and senior high schools taught earth science, biology, chemistry and physics. Out of the five undergraduate teacher-participants, three taught introductory physics while the other two taught general chemistry. The participants' teaching experience ranged from four to twelve years. Pseudonyms were given for each participant as indicated in some of the interview transcripts presented herewith.

The primary mode of data collection was through open online voiced interview. This was supplemented with written interaction through the use of chat-based platforms and email correspondence. Additional data were also collected that include subject matter budget and syllabi, lesson plans, and institutional memos. These data were used for triangulation purposes to establish consistency in the analysis and the consequent claims arising from the interview responses (Heale and Forbes, 2013). Members check was also employed to ensure that researcher's understanding and interpretation of the interview responses as well as those of other related data sources are consistent with the intended meaning of the science teacher participants (Candela, 2019).

Results and Discussion

The general approach in the analysis of the teacher-participants' responses was through deductive coding. A series of dichotomazied sets of categories were used based on the requirements of adopting online distance learning (IRR vs. NIRR), course or subject components in teaching science (experiential vs. non-experiential), and time components of student workload (contact time vs. non-contact time). Deductive coding was chosen in this case since the the specific context and construct to which the inquiry is being pursued are already established and well identified (Linneberg and Korsgaard, 2019). In terms of context, the focus is the adoption of online distance learning in teaching science, while in terms of construct, the focus is the science teachers' conceptions of student workload. The main question during the interview revolves around what teacher-participants think constitute student workload and how this translate in their instructional practice before (pre-pandemic) and during the adoption of the currently used distance learning approach (in-pandemic).

Student Workload as Equated to Contact Time. The teacher-participants consistently and objectively viewed student workload as the actual contact time before the adoption of online learning (pre-pandemic). This essentially equates to the number of hours that the students spend in the classroom having face-to-face classes. For basic education, this is relatively uniform since each level starting from Grade 1 to Grade 12 has a relatively structured schedule in terms of the number of subjects and the time distribution of these subjects for every quarter. In higher education, this could vary as

university students are given the relative freedom to plot their courses to be taken per semester.

This conception of what constitute student workload as simply referring to the indicated contact time in the basic education students' schedule of classes or the higher education students' study loads can have severe repercussions in curriculum implementation. Since non-contact time or the time students spend outside of the actual allocated class time doing academic-related work is not conceived as an integral part of student workload, the chance of overloading students with multiple curricular requirements is fundamentally high as illustrated in the following interview transcripts.

> *Interviewer: Do your students make all their requirements during your class time?*
>
> *Jean (JHS): We are only given an hour for our science class so there...there are times when students have to do the activities as homework.*
>
> *Alex (SHS): It depends. I normally use my class time for lecture and also for scheduled long or unit exams. So... there are also some exercises and problem sets that students have to do outside. Most of the time students do this at home.*
>
> *Sam (UGL): During class time, we have it for around an hour or so. It, um, depends if there is a scheduled laboratory or lecture. Normally I use it for lectures and exams. For the advanced readings and some other assignments, students do it outside of class. And oh yes, they also prepare their laboratory journals ahead so when they come for lab we can have our experiments on time.*

Essentially, the main pre-pandemic conception of the science teacher-participants of student workload does not include non-contact components of the subject/course requirements (e.g., preparation, sourcing, practice, homework, etc.). These accounts are relatively common and all fifteen science teacher-participants have indicated that students generally do academic-ralated tasks (in science) outside of their own scheduled class hours contrary to what literature suggest (Bowyer, 2012; Kyndt, Berghmans, and Bulckens, 2014; Smith, 2019). While accounts from other subject teachers are still yet to be included as they are not part of this study, the overall effect of normalizing students' work outside of the indicated contact time without regard or consideration to students' actual available time is a cause of concern as it encroaches into students' supposedly personal free periods or even on students' quality or family time at home.

Student Workload as Translated Contact Time. To identify whether a change in conception has taken place as a result of the changes in educational practices brought

about by the pandemic, the teachers were asked on what they think constitute student workload now that face-to-face instruction has been replaced by online distance learning. The common response of the science teacher-participants suggest that a simple translation of the prepandemic conception of student workload has occurred. The following sample transcripts reflect this observed translation.

Interviewer: How do you compare the activities or the things that you ask Your students to submit or do as part of your class requirements before when we still have face-to-face classes and now that we have the distance online learning?

Greg (SHS): In our case, we made... we sort of follow the same time schedule last year (2019) although... well we have both synchronous and asynchronous time schedules. Like half of the lectures can be asynchronously delivered.

Eden (JHS): It is more or less the same but the laboratory. I mean, the experiments. I cannot ask students to peform experiments. So... I include virtual labs and give some other questions...or activities.

Joan (JHS): It is harder to teach because I cannot see them (students). Also the three hours we have per week is not enough so I put them in async... like if I cannot finish the lectures and activities I give them (students) instructions to finish the task after our class.

Jess (UGL): This is a bit weird (laughs). I mean, it is different now. Although we still meet three hours a week. Oh wait, not three hours. More like one to one and a half because we are allowed to do async classes. I changed some activities because we cannot do face to face yet. It is... well, like before but virtual this time.

Mina (UGL): Things are very different now. No more going to the university. I mean in person. We still meet three hours a week but most of the laboratory activities are limited. We use videos. I feel like my students... they need... well, I mean they have to do hands-on. I do virtual labs aside from the videos of the experiment. I don't (think).. it's enough so I give readings to enrich them (students).

Based on these accounts, student workload is still largely based on contact time. However, the actual conception of face-to-face actual class time has been translated to the allocated online class time. Moreover, the science teacher-participants explicitly account for both synchronous and asynchronous classes in their responses. Interestingly, the responses of participants still indicate the presence of additional tasks or activities outside of the allocated online class time (synchronous and asynchronous) that translate to both increased teacher and student workload (Dunlap, 2005).

Another notable observation is the teachers' feeling of inadequacy of online learning in addressing the experiential component of teaching science specifically the conduct of laboratory experiments. This perceived loss of an essential experiential learning component compels teachers to resort to additional requirements to compensate. Since the actual allocated online class time remains the same, these additional assignments or requirements become part of the unaccounted non-contact time component of student workload. In effect, this translates to an even higher workload demand to students compared to the pre-pandemic time.

Linking Requirements to Teachers' Conceptions and Practices. One of the key questions given to the teachers was centered on the support that were provided by their respective institutions in the process of adopting the distance online learning mode of instruction. The science teachers respondents identified three types of supports that were provided that include: a) provision of physical infrastructure, b) institutional system and process modifications, and c) provision of human capital upgrading. The physical infrastructure -related supports that were enumerated include computers and other ICT gadgets, provision of connectivity allowance, procurement of learning management system (LMS) and conferencing software/platform, acquisition of virtual proctoring software, and subscription to additional online resources. For institutional system and process modifications, the participants indentified streamlined and full online student admission and promotion mechanisms, provision of online versions and access of student support services, flexibility in conducting synchronous and asynchronous classes, and deployment of a new faculty evaluation tool among others. With regard to human capital upgrading, the participants identified webinars and inputs on the functional use of the newly acquired hardware and software for online learning, developing instructional materials for online learning, assessment of learning in a virtual environment, and mental health-related inputs.

Based on this identified supports, it appears that majority of these scaffolds fall under IRR. This is expected and is relatively understandable since as previously opined, IRR is easily identifiable because of its conspicuous and concrete nature. While human capital upgrading which is an example of NIRR was also addressed, the nature of supports provided in this context is largely focused towards making teachers undergo the shift in modality (modality-enabling) by providing the technical know-how in converting the teaching learning process from face-to-face to distance online learning. In effect, the change that took place can be considered as a 'technical shift' characterized by the functional adoption and usage of new technologies and approaches of distance online learning. This is an essential shift albeit an incomplete one.

Implications to Policy and Practice

As we continue to face the challenges and identify opportunities in our attempt to ensure the continuity and quality of education in the midst of Covid-19, more research is needed to explore and leverage on teachers' conceptions and understanding on how different educational ideational constructs should have shifted as a result of this change in modality. This is is essential to ensure that the infrastructure-related supports are both complemented and supplemented with appropriate educational conceptions that will translate to sound instructional practices.

In terms of policy, learning institutions should have a clear cut understanding on what constitute student workload. This understanding should be translated into an actual policy that strikes a balance between the desired educational outcomes and the actual available student resources in terms of time. A concrete example for policy development is the mandatory inclusion of student learning time to account for the non-contact component of the different subject or course requirements.

In terms of practice, both contact and non-contact time allotment for each subject or course should be explicitly identified in all relevant curricular documents. This will ensure that teachers are aware of the amount of time than can be reasonably allocated for their class respective requirements. This also allows students to take ownership of their learning and develop the habit of timeliness in completing their course-related deliverables. Moreover, there is a need on the part of the teacher to be more discerning, reflective, and deliberate in choosing teaching-learning activities that could effectively target the desired educational outcomes without increasing workload on the part of the students.

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