Online Teaching and Learning in Asian Higher Education

Pedagogical Approaches to Classroom Practices

Edited by **Misty So-Sum Wai-Cook**
Amany Saleh · Krishna Bista

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Online Teaching and Learning in Asian Higher Education

"*Online Teaching and Learning in Asian Higher Education* is an innovative collection as it provides insights into online learning environments related to Asian culture and education while presenting practical applications for future recommendations for students, educators, and practitioners."

—Katie K. Koo, *University of Georgia, USA*

"This volume is an important guide for instructors, researchers, and institutional leaders to inform policy and practice surrounding online learning."

—Karlo Avenido, *GUS Canada Colleges, Canada*

"This book includes all the up-to-date information you want to know on online teaching and learning during COVID-19. It would help educators better understand and serve online students. I highly recommend it to all educators."

—Jing Hua, *Troy University, USA*

"This book comes in handy at a time when individuals and institutions alike are grappling with online learning. The focus on Asian higher education is especially relevant and would be of interest to educators and policymakers in the region."

—Sarah Jane Lipura, *University of Auckland, New Zealand*

"As we all attempt to define the "new normal" after the COVID-19 pandemic, this book provides a new perspective on online teaching and learning. The chapters offer tangible items that are useful for educators across the globe to incorporate into their day-to-day work. This book captures the new era of higher education and gives an in-depth glimpse into what this generation of students is experiencing."

—Yuan Zhou, *Sul Ross State University, USA*

"This book is an important resource for international students discussing current issues in the field of online learning in Asian countries. And it will be an essential guide to researchers and readers who want to learn in this field."

—M. Said Doğru, *Kastamonu University, Turkey*

"Education has undergone an immense digital transformation over the past decade, with digital tools and teaching undoubtedly becoming critical for reducing and minimizing barriers to education during the pandemic. This book is a valuable resource for educators, practitioners, and other educational staff members as it critically examines online teaching and learning, innovative digital developments within the curriculum, effective teaching strategies and practices, and the challenges faced in Asian higher education during COVID-19."

—Helen Liu, *York University, Canada*

"Such an amazing resource to draw wisdom from. In the age of digital transformation, practitioners and researchers in student engagement could learn so much from this book about engaging students digitally outside of classrooms. Thank you for your contribution to benefit colleagues and students in a broader scope to support students to thrive in an exciting time and space."

—Ken Guan, *Fuller Theological Seminary, USA*

"The importance of sustaining good online engagement practices beyond the immediate needs of a pandemic situation cannot be overemphasized in a world where learning and teaching must align with authentic student work-life experiences. The good work educators have done in developing student learning from a distance, through optimizing technology, is documented in this volume as a resource and an invitation to further conversations as we continue to finesse our craft in different contexts. I recommend this as a crucial part of our learning journey."

—Chng Huang Hoon, *NUS Chua Thian Poh Community Leadership Center*

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Amany Saleh

INTRODUCTION

Online teaching and learning have become increasingly prevalent in Asia in recent years as technological advancements have made it easier for educators and students to connect remotely. This shift has been driven by a variety of factors, including the need to provide education to remote and rural areas, the increasing popularity of online education among students, and the COVID-19 pandemic, which has accelerated the move to online learning.

In the spring of 2020, the world population faced an unprecedented challenge as they were forced to lock themselves indoors and close their businesses and schools. Higher education institutes were no exception! They closed their schools and sought ways to educate their students. Luckily, innovation has been a key feature of higher education in facing

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social and economic challenges. The university leaders were quick to provide faculty with the needed technology, train them on the use of such technologies as well as offer support with the delivery of their courses. Some faculty members were either delivering their courses online or familiar with the technology and were better positioned for such transition, but the majority did not rely on technology to deliver their instruction.

In this book, the authors share their reflections, experiences, practices, and research findings in delivering their courses during the pandemic. Many of them reveal innovative and alternative strategies they implemented in their courses to better meet their students' needs. The writings in this book highlight some of the weaknesses associated with the online infrastructure, the limited teachers' knowledge with the available technology, the inadequate access to the internet, and the equity issues associated with online learning and teaching. The writings also provide innovative and groundbreaking teaching approaches utilized by teachers in higher education in Asia in both developed and developing economies. The authors demonstrate how online experience can be different for teachers and students and how they can overcome some of the pitfalls of online education of the past.

Online courses offer easy and convenient access to students who are unable to attend the brick-and-mortar classes. Online education offers flexibility of time and space as well as cost-effectiveness to students but also presents challenges such as the need for self-discipline, time management skills, and comfort with the technology, among others. Similarly, online education offers instructors chances of providing innovations in teaching and flexibility of time. Online learning affords teachers the opportunity to augment their teaching with multimedia applications, simulations, chats, games, to name a few. However, online education presents the challenge of extensive preparation, mastery of the technology, and time commitment to communicating with the students.

Asia is a continent that led the world in its emphasis on innovation and technology (Wong, 2019). The Bloomberg (2021) innovation index included two Asian countries as the top innovative countries. Over 80 percent of Asian countries rated above average on the Organisation for Economic Co-operation and Development's (OECD, 2014) innovation in education index. It is evident that these countries realized that technology is essential to teaching innovations (Wong, 2019). As a result, many countries in Asia have put major emphasis on training their students on the latest technology among other skills that will prepare them for the global workplace. For example, India incorporated the

twenty-first-century skills in their standards framework (NEP, 2020) and mandated the implementation of these skills along with technology mastery skills in their higher education institutions.

Technology has become an indispensable part of education at all levels from kindergarten to graduate school. In Asia, higher education institutes had witnessed major development aimed at improving students' learning experiences before the pandemic. Educators tried to explore new teaching practices to ensure students are engaged by creating personalized learning experiences and by employing digital tools to ensure accessibility of content to their students.

In the last 40 years, Asia has witnessed an amazing growth of higher education in general and e-Learning, in particular. Countries such as Malaysia, Indonesia, China, and India had witnessed record enrollment in their online and blended higher education before the pandemic. However, issues of accessibility, quality, and equity remained a challenge for many countries in the Asian continent. As many countries in Asia, and most countries around the world, were forced to transition to online mode of delivery during the pandemic, they faced challenges of equity of access, infrastructure, students' and teachers' readiness to adapt to the online learning approach. However, most universities in Asia made great strides in providing online education for students during the pandemic. For example, by June 2020, 90.3% of universities in Japan were providing instruction through digital platforms (Hayashi et al., 2020). Additionally, many Asian countries have been investing heavily in online education, with China alone investing over $1 billion in the development of online education platforms (Zhang, 2020).

Employing technology to deliver and implement new teaching methods has been a key feature of higher education (Zhu et al., 2013). Even though online teaching was not new to college campuses, most faculty members had no-to-limited experience with online teaching. This made the sudden transition to online instruction very stressful to many teachers and students alike. The delivery of instruction and the interaction among teachers, students, and peers in the online class differ greatly from those of the traditional class. Innovations in teaching and learning during the pandemic emerged as teachers experimented with different tools and teaching methods to better communicate with and motivate their students.

Additionally, there is an increasing demand for learners to actively engage in their own learning by taking a more significant role in their own learning (Zhao & Watterston, 2021). To accommodate students' diverse

needs and a vast range of abilities, teachers have been trying to provide students with choices in instructional delivery and learning assignments. The call for personalized learning (Kallick & Zmuda, 2017; Kallio & Halverson, 2020) has amplified the need for empowering students to identify their learning strengths and weaknesses and chart their learning paths (Zhao & Watterston, 2021). Online delivery models allow teachers the opportunity to offer students different ways of accessing knowledge and demonstrating their mastery of content and/or skills to be learned. The findings of Yip et al. (2021)'s study indicated that students in Hong Kong and Japan preferred using mobile library learning apps as an important learning tool in higher education. Zhao (2011) argues that if students have the right for self-determination, they should have the right to determine the conditions they want to learn.

Online teaching offers opportunities for educators to develop innovative learning environments for a diverse group of students (Sadiku et al., 2018). As we read the chapters for this book, it will become evident a majority of faculty members were unprepared to the rapid transition to online delivery model. Some had previous experience with online instruction and technology, which made the transition somewhat easier for them. Those who had experience with online education took the opportunity to restructure their courses and enhance their communication with the students as well as experiment with new assessments of learning methods. Those faculty members who had no-to-little experience found it harder to adapt to the new delivery model and to communicate with their students. Still, many of them embraced some aspects of the new delivery model and the technology used and found them helpful in reaching their students and achieving their instructional goals. Some contended that they will be taking these techniques and methods back with them to their traditional classrooms after the pandemic. The findings echo those of earlier research in the United States (Saleh et al., 2022). Similarly, Marcus (2022) contends that the emerging research on online higher education after the pandemic shows that faculty feel more positive about online teaching than before the pandemic and they see more of a trend toward a blended model of instruction delivery.

With the increased online enrollment, there was an increase in research on the quality of online teaching and learning, effective strategies used by instructors, and innovative opportunities in online teaching and learning. The onset of COVID-19 has made online learning the sole delivery method of instruction around the globe (Martin et al., 2020). For

example, a large-scale survey of Indonesian college students' perceptions of their online experience showed that almost 50 percent of the students found it hard to stay focused, thought lectures online were less effective, and reported that interactions with their teachers and peers to be harder than in the traditional class (Kurmala, 2020). Another study found that students in Asia often struggle with the lack of social interaction and support that is typically provided in a traditional classroom setting (Kanchanachitra, 2019). Online education can be less effective for students who lack access to reliable internet and technology, or who struggle with self-motivation and self-discipline.

In this book, some teachers examined students' perceptions of their experience with online education during the pandemic. The students reported challenges such as having high-speed and reliable internet to access class lectures and content, having adequate living conditions that afford them quiet study environments, and adjusting to the different structure of the online class. On the other hand, students found the technology employed allowed them freedom to save and access the course materials at their own pace. Other students reported that the variety of learning activities, the use of chat rooms for discussions, and the collaborative projects were very useful and enjoyable.

The book includes four sections that deal with issues pertinent to online teaching in higher education during the pandemic. These sections are: 1. Innovation in curriculum design and development; 2. Innovation in student engagement; 3. Innovation in assessment of students' learning; and 4. Innovations in the use of technology in the class. The collection of chapters includes reflective practices, conceptual papers, and empirical research. All contribute to the field of higher education in general and online teaching, in particular. Specifically, the scholarly contributions highlight the innovation of research and teaching practices in higher education in Asia. Additionally, the writings provide insights into how the academic community in Asia employed technology in developing innovative methods of teaching, engaging, and communicating with their students, as well as assessing students' learning during the pandemic. Many of these issues emerged or proved critical for instructors during the pandemic. The contributions in this book include examples from developed and developing countries in Asia.

In the first section: Innovation in Curriculum Design and Development, the authors share inventive ways they approached their teaching and modified their instruction to provide students with meaningful online class

experience. The authors discuss how these changes have improved their teaching and contributed to their students' learning. Their writings provide insights into how to employ many new digital tools and restructure their classes in a way that keeps students engaged and motivated to learn.

In Chap. 2, "Microlearning: A Faculty's Experience," Lee offers insights into microlearning when used to support students' career planning using the blended learning approach. The author dispels misconceptions of microlearning, illustrates the challenges associated with their development and implementation, and shares lessons learned from the design and development of the Career and Professional Development module. Lee recommends best practices in designing and developing micromodules based on a five-year experience offering micromodules to undergraduate and graduate students at the Center for Communication Skills at the Singapore Institute of Technology. The author points out that learner-centric design, student engagement, and learner control need to remain the crux of microlearning development and design. With an increase in college enrollment, and continuous dwindling resources, Lee offers microlearning as an effective supplementary tool to the traditional class that is scalable, accessible, and cost-effective.

Renuka Sathasivam, in Chap. 3, "Changing to Online Teaching Successfully: Evidence from Student Learning," illustrates the impact of transitioning to online course delivery model from the perspective of a teacher as she examines her students' learning in this new format. Sathasivam employs an ethnographic research approach to examine and document the changes in her attitude and beliefs of online teaching overtime as she, like many others, was forced to transform her teaching online during the pandemic. Sathasivam offers a framework through which she examines her change-in-action to improve her teaching and students' learning. She takes us on a tour as she reflects on how her teaching changed to accommodate this transition and how her perception of the effectiveness of online teaching changed as she observed her students learn online. Her findings affirm that courses can be successfully transferred to online format maintaining students' interest and autonomy. Her research provides a valuable tool for educators as they contemplate ways to improve their students' learning in the online class. She bases her research on the teacher change theory which contends that teachers change their beliefs and practices only when they try new methods and find them successful.

Huang, Oon, and Benson in Chap. 4, "The Use of Learner-Centered Pedagogies and E-Portfolios to Facilitate Pre-service and In-Service

Teachers' Development in an Asian System," share their experience with implementing learner-centered teaching and e-portfolios in two courses of pre-and-in-service teachers at a public university in Macau. The courses were focused on three main educational components: (a) learning theory, (b) assessment of and for learning, and (c) learner-centered pedagogies. The students were surveyed for their perceptions of the course regarding the following elements: learner-centered pedagogy, the use of e-portfolios, motivation to learn, and engaged learning. The findings provide great insights for educators as more instructors move toward online teaching. Their results demonstrate that students found e-portfolios helped them become more organized, self-directed, and reflective practitioners. Additionally, the researchers reported the students were more motivated and engaged in their learning than in the past. The findings of the study provide great information about the impact of the use of e-portfolios in promoting students' engagement not only in the online classes but in the traditional settings as well.

In the second section of the book, Innovation in Student Engagement, the authors share innovations in online teaching practices that focus on students' engagement and interactions. In this section, the authors offer unique ways of communicating with students in the online classroom. The section includes conceptual frameworks as well as empirical research that focuses on students' thinking skills, communication skills, and well-being, among others.

In Chap. 5, "Project-Based Approach to Enhance Online Learning: A Case of Teaching Systems Thinking and System Dynamics Modeling," Bellam Sreenivasulu contends that online and hybrid teaching approaches differ greatly from traditional face-to-face teaching. Sreenivasulu agrees that online teaching can prove to be challenging in successfully delivering the content and engaging the students in order to achieve the desired learning outcomes. Learning-centered teaching underlines students' needs by providing a wide variety of activities that motivate students to learn. The author in this chapter postulates that students' engagement and learning depend on the pedagogical content knowledge (PCK), content knowledge (CK), scaffolding activities, and the learning activities. Sreenivasulu offers, in this chapter, a model for implementation of a project-based learning that employs a systems thinking and system dynamics modeling in the online class to engage students in their learning. Such a model poses to educators a different way of thinking and organizing

their teaching that should prove valuable as they attempt to pursue innovative ways of reaching their students.

In Chap. 6, "Pedagogical Approaches of ESL Educators with an Intent-Focusing on Interaction, Time and Pace During COVID-19: Lessons Learnt," Ravindra, Lee, and Amini examine the transition of ESL teachers' approach from traditional face-to-face classrooms to online delivery model during the COVID-19 pandemic. They conducted empirical research focusing on three pedagogical aspects: students-teachers' interactions, time, and pace of online teaching activities. The authors employed a qualitative approach that included teachers' interviews, class observations, and fieldnotes to collect data from ESL classrooms at a private college in Malaysia. The interviews elicited teachers' perceptions of the pedagogical approaches implemented during the pandemic and the challenges they faced in delivering their courses online. The interview data were corroborated by data collected from class observations and researchers' fieldnotes. The findings indicate that there were successful interactions between students and teachers and students and content, but not for all units and not consistently for all students. The teachers reported they found keeping students engaged and focused on the course content extremely challenging; however, they stressed that effective activity planning, time management, and appropriate pacing are essential for improving classroom interactions. The authors offer recommendations for future online ESL teachers.

In Chap. 7, "Beyond the Effectiveness of Online Learning in the COVID-19 Pandemic: A Perspective of Hong Kong University Students' Well-Being," Xiong takes a unique view of the transition to online teaching: The student well-being. Xiong aimed to examine the well-being challenges students faced during the pandemic and what were the responses from their universities to these challenges. The author surveyed a large number of Hong Kong university students. Xiong's findings demonstrated that students experienced physical and psychological challenges as well as living conditions that negatively impacted their learning. He implores higher education institutes to promote students' well-being through course restructuring and relevant professional development for instructors, not only to better prepare them to deliver their courses online but also to better address their students' non-academic needs.

In the third section of the book, Innovation in Assessment of Students' Learning, the authors tackle students' assessment in the online classroom. In this section, the authors share innovative ways for assessment methods

for the online class. The authors share some conceptual frameworks and models of assessment implemented in their classes to improve students' learning and enhance the quality of teachers' feedback. Such knowledge can prove very useful for online instructors in higher education.

In Chap. 8, "Promoting Online Authentic Continuous Assessments," Lim, Chua, Avnit, and Wang introduce innovative assessment practices they adopted at Singapore Institute of Technology. They shared the university's effort in transforming assessment practice, through considering students' course load, redistributing assignment grade weights, providing instructors with opportunities for critical reflection on their assessments, and having conversations to share new assessment designs. The assessment considerations included flexibility, scalability, reliability of assessment, and careful scaffolding of students' learning. The authors in this chapter share instructors' experience as they transformed assessments to be online and authentic. The aim of transforming assessment practice was for students to receive earlier and more frequent feedback which in turn can improve learning outcomes. Lim, Chua, Avnit, and Wang's chapter offers educators an opportunity to reflect on our assessment procedures and work toward a culture of learning from fellow educators in designing online, authentic assessment.

In Chap. 9, "Assessment and Teaching of Twenty-First-Century Skills for Students of Engineering," Mekala, Sangeetha, Harishree, and Geetha provide a framework for implementing twenty-first-century skills in the English courses for engineering students in online classes in India. Specifically, the authors propose a set of tasks and assessment activities to implement in the online English classes for imparting twenty-first-century skills for engineering students. The authors argue that such a framework helps students master twenty-first-century skills as well as remain motivated to learn. They make recommendations for strategies to develop twenty-first-century skills in the online class for engineering students that will prepare them for their professional careers. Lessons learned from this chapter are not limited to engineering students but can be applied to all ESL students since these methods promote critical and problem-solving skills as well as communication skills. All these skills are critical for all school graduates to be successful in their designated careers.

In Chap. 10, "Communities and Engagement: Are Students Still Able to Demonstrate Empathy in an Online Course?", Misty Wai-Cook shares her experience in teaching listening skills to emphasize empathy by utilizing experiential learning in an online, communication class. She offers

details on her course design that enables students to understand. learn, and practice their listening skills and demonstrate empathy to community members in the online class. Wai-Cook provides an example of a course project that emphasized community involvement and empathy as well as evidence of students' work in the form of reflective writing that clearly illustrate that students were able to understand the theories and concepts underpinning the activities and the value of learning these skills. Wai-Cook's experience adds a valuable perspective on how educators can find online alternatives to the traditional community-based activities of the in-person class without sacrificing the focus and the rigor of the course.

Digital learning tools played a significant role during the pandemic in delivering courses to college and school students during the pandemic. The success of online education relies heavily on the available technology, internet access, and to a large extent on the teachers' familiarity and experience with technology. In the last section of the book, Innovation in the Use of Technology in the Class, the collections of chapters highlight the innovation of employing technology in the class to enhance students' learning and communication skills among others.

In Chap. 11, "Navigating Digital Environments One Step at a Time During COVID-19," Bhati and Fink examine the impact of the pandemic on learning and teaching for college students at James Cook University in two different countries: Singapore and Germany. The two universities had well-established, blended learning but were forced to transition to a total remote model during the pandemic. In this chapter, they reflect on the impact of this transition on the student-centered, digital environment where students were actively constructing their knowledge. The authors explored the impact of such transition on school culture, collaboration, social activities, and professional learning in and out of the classrooms. The authors share a framework for new standards for digital learning that can be utilized in future blended and online classes. As we go back to traditional classes, Bhat and Fink's model offers us ways to incorporate technology in all of our classes to better serve our students.

In Chap. 12, "Practical Reflections on Meshing the Analogue and Digital Teacher Self Through Pushed Change," Stephen Hall reflects on the teachers' transition from the analogue to the digital self-image. He argues that many teachers were not prepared to transform their courses and their roles as facilitators of learning into digital format during the pandemic. Hall reasons that teachers need to take advantage of the opportunity to move beyond the dichotomies of online and traditional classes to

adopt educational approaches that encompass multi-modality and digital literacy. He asserts that incorporating a wide range of interaction modalities, digital literacy, and visual awareness will increase language learners' engagement and motivation. As we go back to the traditional classroom, we need to examine ways to incorporate many of the digital tools that enhanced our teaching during the pandemic and not, as Hall argues against, go back to separating the classroom into physical and digital worlds.

In Chap. 13, "Teaching Presence in an Instant Messaging (IM) Community of Inquiry (COI): Telegram as a Virtual Learning Environment (VLE)," Firdaus and Shahid reflect on the first author's lived experience teaching full-term courses using Telegram, an instant Messaging platform. The authors offer strategies for teaching via this platform. They argued that using Telegram will enhance course delivery methods in the future. They chose Telegram as a low-band alternative to ensure accessibility to students with poor internet connectivity during the initial unexpected COVID-19 pandemic lockdown. The authors point out that such a platform was not built for teaching, but they were able to employ its features to deliver lectures, facilitate classroom interactions, utilize breakout sessions for group work, and for some level of assessment. The authors share lessons learned from using Telegram for course delivery over three semesters and highlight the potential for its use in the future. This is important because it was evident from the literature (Kurmala, 2020) that accessibility and speed of the internet was one of the most challenging issues teachers and students faced during the pandemic.

In Chap. 14, "ICT and Twenty-First-Century Skills for Students of Engineering," Mekala, Harishree, and Geetha explain how the transition to online course delivery mode due to the pandemic represented an opportunity for ESL engineering teachers to include twenty-first-century skills in their curriculum. They pointed out that employers consistently complained about engineering college graduates lacking twenty-first-century skills. This gap manifests itself in a higher unemployment rate for engineering graduates in India. The authors propose the integration of these skills in the English classroom for engineering students. They argue that online courses are suitable for students to practice twenty-first-century skills. In this chapter, they specifically focus on four Cs of twenty-first-century skills: Creativity, Critical Thinking, Communication and Collaboration. They advocate the integration of these skills utilizing Dornyei's motivational strategies and employing ICT tools for equipping

the students of engineering to be career ready. The argument presented in their chapter furnishes support to the existing literature and the framework they are introducing provides a solid model for integration of these skills in the ESL, online class for engineering students.

The concluding chapter summarizes the adoption of online teaching practices and pedagogical innovation in Asia during the COVID-19 pandemic, drawing insights from educators and researchers across multiple disciplines. It highlights the significance of learner-centered pedagogies, technology integration, and student well-being, while emphasizing the role of authentic assessment in fostering deep learning.

Online education will remain an important mechanism for delivering instruction for higher education. It was important to understand issues and challenges that higher education faculty members experienced amidst the transition to online during the pandemic. As we go back to the traditional, in-person class, we must reflect on the lessons learned during the pandemic and the digital tools that enhanced our teaching. We must examine the effective e-learning tools that we utilized during the pandemic while understanding the limitations of the technology. Although there have been tremendous challenges for educators at the college level employing online technology to deliver courses, there emerged many opportunities for college educators to learn and implement e-learning in their courses. The use of platforms such as Microsoft Meet, Zoom, Telegram, WhatsApp and others were explored for the first time by some teachers to deliver their courses. Many of the teachers now see how these technologies can aid them in enhancing their teaching even when they go back to their face-to-face courses. A sentiment shared by many of the authors in this volume.

The COVID-19 pandemic has imposed a unique set of challenges to higher education. A total of 1.3 billion students around the world were affected by their inability to attend their classes at all levels of education (UNESCO, 2020). The drastic transition from in-person courses to remote or online classes negatively impacted both teachers and students psychologically, socially, and cognitively (Crespin-Trujillo & Hora, 2021). Limited access to the internet at home to retrieve course materials and attend synchronous class meetings was one of the most reported obstacles with this transition all over the world, in both developed and developing countries.

It is important to acknowledge that such a sudden transition was fraught with challenges such as lack of minimal training or familiarity of

faculty with online course delivery technology. However, such a transition offered us opportunities to learn from other instructors' strategies and practices proved successful in reaching students and delivering courses during this time. The pandemic has provided us with a way to forge new pathways to online teaching and employ the technology to better teach our students even those in the traditional classrooms.

It is evident that the rapid transition to online delivery model was a challenge to all educators, but this transition has afforded many teachers the opportunity to explore new ways of delivering instruction and learning new technology. It behooves us to build on these methods and incorporate these technologies into our teaching as we go back to the traditional class to accommodate our students' diverse needs.

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Innovation in Curriculum Design and Development

Microlearning: A Faculty's Experience

ChienChing Lee

CONTEXT

The pandemic has pushed many higher education tutors and students to adopt online learning (Lee, Fanguy, et al., 2021). Online or remote learning could include uploading lesson materials such as PowerPoint slides, and e-resources to an institution's learning management system (LMS) and lessons are taught synchronously via video conferencing software such as Zoom or Teams or recorded for students' viewing asynchronously.

While many are familiar with online learning, microlearning is not as widely known. Khan in Corbeil et al. (2021) defined microlearning as 'a single objective-focused, outcome-based, stand-alone, meaningful, and interactive learning unit delivered in bite-sized snippets (i.e., a short modular format) either digitally (i.e., via computer, tablet, or mobile phone) or non-digitally (i.e., as via a flashcard or booklet)' (p. 6). In line with the focus of this book on online learning, this chapter will present the delivery of microlearning via digital means.

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Microlearning is not a new fad. Research shows that microlearning (without the prefix 'e') has been delivered to students via various online platforms such as social media platforms, web-based and e-learning platforms, smartphone applications and custom developed platforms (Shatte & Teague, 2020). The increased interest in microlearning in the digital age is fuelled by a few factors. The average attention span of humans in the digital age has fallen from 12 seconds to 8 seconds (Gausby, 2015) with 40% of users likely to leave a website if it does not load in less than 3 seconds (Wertz, 2017). This implies that students prefer learning to be chunked in bite-sizes and available to them whenever they need it (just-in-time). Torgerson (2021) further identified that microlearning is growing in usage as it integrates formal and informal learning and makes learning more accessible and personalized. Online learning platforms allow students to access microlearning as and when they want it. Gamification features such as progress tracking, badges for completion of microlearning units and leader boards further motivate students to engage with the learning materials. Tutors can also mine data from the online platforms to analyse areas in students' learning that need to be further supported in an efficient and easy manner.

There are many concepts and versions of microlearning due to differing interpretations regarding time, content, curriculum, form, process, modality and learning type (Hug, 2006). However, there are common characteristics in microlearning that differentiate it from e-learning per se.

A microlearning unit is performance-focused where the content aims to cover narrow and simple (but important) skills elements or to plug skills gaps (Torgerson, 2021). In practical terms, a microlearning unit is bite-sized (about six to ten minutes long) and focuses on honing one to two skills in any of the three contexts of use: to pre-assess students' knowledge of a concept, to introduce new concepts during instruction or to provide for reinforcement and review after instruction. Kapp and Defelice (2019) add that microlearning units should not be used as standalone units. Instead, the unit needs to be situated as part of a larger learning strategy (such as blended learning) to optimize its effectiveness. Thus, a face-to-face assessment on the learning outcomes of the unit could follow upon completion of the microlearning unit, after a spaced interval, to optimize its effectiveness.

A microlearning unit is also interactive in nature. According to Kapp and Defelice (2019), microlearning focuses on learner engagement where students need to interact with multimodal learning materials presented by

making choices, keying in inputs, or creating objects in response to multi-modal stimuli. In short, microlearning is more than a talking head.

As a software, a microlearning unit can be designed to provide students with control over when and how they would like to engage in spaced review of the learning content (Kohler et al., 2021). Students can choose to start the unit from the beginning, continue from where they stopped previously or go through the entire unit again, re-attempting the activities. The unit could also be designed so that students receive automated feedback for each attempt made on the activities in the unit.

A microlearning unit is also scalable. For example, once an online platform is identified (usually the university's learning management system is used), the unit can be utilized in cross-curricular instruction in foundation programs to maintain the quality and consistency of resources provided to students across similar programs (Kohler et al., 2021).

The Singapore Institute of Technology (SIT) is an applied learning university with most of its undergraduates coming from the polytechnics. The Centre for Communication Skills (CCS) offers regular modules (12-week seminars) and additional support via embedded workshops (3 hours) in classroom settings, and peer tutor-supported online communication help-desk feedback services on students' written and oral assignments. However, these support services occur at limited touch points in the students' undergraduate journey.

In 2017, CCS started developing communication skills micromodules from scratch to help us support students in their practice of effective communication skills in a consistent manner throughout their undergraduate journey. We developed our own micromodules as we knew our students' needs and wanted to cater to these needs in a targeted manner. Furthermore, the micromodules are scalable, accessible 24/7, and involve only a one-time development cost.

So far, CCS has developed and rolled out seven micromodules to its student cohort via the university's learning management system. They are used in a blended learning mode and/or as supplementary e-resources in regular modules. The micromodules are English Quest, Managing Meetings, Interpersonal Skills, Career and Professional Development, Email Writing, Academic and Technical Writing and Critical Reflection. As the faculty in charge of developing and implementing these online micromodules, this reflection aims to share the challenges I faced, lessons learned and recommendations for best practices in adopting microlearning in IHLs.

Literature Review: Theoretical Underpinnings for Microlearning

Dolasinski and Reynold's (2020) microlearning model form the theoretical underpinning for microlearning while Khan's e-learning framework visualized through the lens of microlearning (Corbeil et al., 2021) provides a multidimensional roadmap for the effective implementation of microlearning solutions. Both frameworks are mapped together to form a holistic picture of the development and design process of microlearning and explained in Table 2.1.

The first phase in the development and design of a microlearning unit is to evaluate and identify the students' learning needs and thereafter to define clear and specific skills-based objectives or learning outcomes and the corresponding assessment. It is noted that software development is expensive and time-consuming. Thus, tutors need to evaluate early whether the microlearning route is the best way to achieve the learning outcomes intended (Lee, Tan, et al., 2021).

Once the learning outcomes are confirmed, phase 2 starts. In this phase, the concept and content of a microlearning unit is elaborated on or scripted. The tutor needs to bear in mind that each microlearning unit is a complete and discrete learning activity and must be kept bite-sized to

Table 2.1 Frameworks underpinning the development and design of microlearning (mapped)

Dolansinski and Reynolds's microlearning model	Khan's microlearning framework
Phase 1: Identify students' needs	Evaluation (single learning outcome and its assessment) Institutional (cost effective, scalability)
Phase 2: Development, and design of the learning concept and content	Pedagogical (interactive, engaging, multimodal, bite-sized) Technological (device independent regardless of time or online platform) Ethical (diversity and digital equity)
Phase 3: Students' participation, practice, and demonstration of their learning	Interface design (user-friendly) Resource support (retention boosting just-in-time and on-demand)
Phase 4: Learning analytics to evaluate the effectiveness of the learning content to students' learning	Management (maintenance, security and quality control)

reduce students' cognitive load (Kirschner, 2002) and improve recall (Fountain & Doyle, 2012). This also implies that microlearning is more appropriate for the learning and practice of simple rather than complex skills like problem-solving. Furthermore, the content needs to reflect diversity in perspectives (should not be narrow or biased). The content is then designed for interactive and multi-modal delivery. This is meant to cater to students with different learning styles and to enhance comprehension, engagement and retention of the concepts learnt (Mason, 2018). The type of content developed is also subject to technological and ethical issues and should be considered early in the development stage. This is because tutors need to ensure that all students can access the microlearning materials regardless of device, time or platform.

Phase 3 involves students' participation, practice and demonstration of their learning. When learning a new skill, active learner participation (Martinez, 2010), spaced repetitive learning via practice over extended periods of time (Doyle & Zakrajsek, 2013) and performance feedback (Gaba & Joseph, 2013) are critical as these improve retention of concepts in long-term memory. Thus, tutors need to ensure that the interface design is user-friendly (intuitive to the students) and provide for software features like automated feedback or aids like infographics that boost students' retention on what they learnt in a unit. Providing students with control over what and when they learn also aids in improving students' online learning self-efficacy (Taipjutorus et al., 2019). Stary and Totter (2006) further found that putting learners in control of the learning process allows for context-sensitive interaction.

In phase 4, learning analytics can be used to evaluate the effectiveness of the learning content to students' learning. For example, data could be collected from the online platform to examine the frequency and duration of use, with the option of using surveys or various qualitative methods to form a more holistic picture of students' learning using the microlearning unit.

Studies have been conducted to investigate the effectiveness of microlearning on student learning outcomes. In terms of performance, Han's (2019) study on microlearning showed that the experimental group had a significant improvement in their English exam scores compared to the control group. The improvement was attributed to the brief and focused learning content, active learning activities (compared to PowerPoint and other passive e-learning resources), learner control over their pace of learning and multiple opportunities to review the microlearning material.

The interactive nature of microlearning with automated feedback also aids learner engagement with the material. Polasek and Javorcik (2019) found that there was a positive significant difference in students' knowledge in Computer Architecture and Operating System Basics when they converted their e-learning material in the form of pdf documents in the LMS to interactive microlearning materials using videos, interactive elements, and quizzes.

In terms of spaced review, students were reported to prefer watching microlearning videos with timeline-based text annotations as they were bite-sized and could be repeated for review (Van der Westhuizen & Golightly, 2015). Correa et al.'s (2018) study also showed that students who used the microlearning method (compared to the cookbook method) were able to develop small web applications quicker and completed more iterations as they could review the material repeatedly.

In summary, the development and design process for microlearning is similar to that of traditional materials development with the first step being the identification of students' learning needs. However, in the case of microlearning, the learning design is performance-focused on one to two simple skills as it is bite-sized. As student engagement is critical in microlearning, each unit consists of multimodal activities for students to practice the specific skills identified. However, it is noted that the user interaction is pre-designed (scripted) and the type of learner responses constrained to facilitate automated feedback.

Pedagogical Approach Adopted in Teaching Using Microlearning

I have been teaching communication skills for close to three decades in institutes of higher learning and observed that not much have changed in terms of students' needs in communication skills coaching. The key changes are in students' attention span (which is getting shorter), a desire for a higher level of engagement, and immediacy in practice and feedback.

I would thus like to share my reflections in incorporating the use of a micromodule in my teaching of the Career and Professional Development (CPD) module. The CPD module was a regular six weeks, three hours module that was taught by CCS faculty across programs in SIT. It aimed to prepare students for their internship application. The online

micromodule was developed in collaboration with the Centre for Career Readiness, SIT.

The CPD module was delivered using the blended approach. In the physical classroom component, the students were taught how to write resumes, cover letters, and perform in interviews, with feedback provided. In the online micromodule component, students went through the micromodule independently and wrote a 10% graded reflection assignment based on what they have learnt from the micromodule at the end of the module.

The decision to adopt the microlearning approach was based on scalability, accessibility and consistency considerations as the module was taught across programs. Furthermore, when the CPD micromodule was being conceptualized, CCS had already developed and rolled out two micromodules to students via the LMS: English Quest in 2018 and Managing Meetings in 2019. Thus, CCS had the experience in developing micromodules. It was also felt that the microlearning approach which was multimodal and interactive in nature could engage students more (compared to a lecture) and provide for spaced review and reflection as students learnt how to manage their career.

The first step in our microlearning development and design process was to determine the career and communication skills that students needed support with prior to and during their internship. Thus, we gathered students' primary concerns through focus group discussions with students who have completed their internship. The units identified for development fell into two categories: 'Getting the Job' and 'Surviving the Job'. We also decided that the titles of the topics should reflect frequently asked questions by students so that students could relate with the content in the topics easily (Table 2.2).

Table 2.2 Titles of topics in the CPD micromodule (online component)

Topic	Getting the job	Topic	Surviving the job
1	How do I plan my career	7	I did not sign up for this
2	Is this job suitable for me	8	My boss hates my work
3	Should I join this company	9	I can't get along with my colleagues
4	I cannot find the job I want	10	Do I really have to work so hard
5	Help! I failed my interview		
6	How do I get hired		

Each microlearning topic was performance-focused with the title of each topic forming the learning outcome for the unit. The content for each topic was then scripted with interactivity in mind as it was important to keep students' engagement level high. Thus, each topic was divided into three segments: Readiness (an activity to prompt their prior knowledge), Discovery (the main content segment on the learning outcome) and Reinforcement (a quiz). This segmentation also reflects that each unit was a complete and discrete learning activity (Fig. 2.1).

For example, in topic 2 'Is this job suitable for me?' the Readiness segment had students attempt a quiz to help them find out their level of awareness regarding quirks in various industries and broaden their perspectives on jobs they might not know of or were unfamiliar with. In the Discovery segment, students watched an animated video (PowToon style) that helped them to manage their expectations in their job search. They were also urged to identify what they should research about the job they were applying for and the organization offering the job, and provided with credible resources to help them find out more about the job. In the Reinforcement segment, students had to answer a quiz to reinforce what they learnt in the Discovery segment.
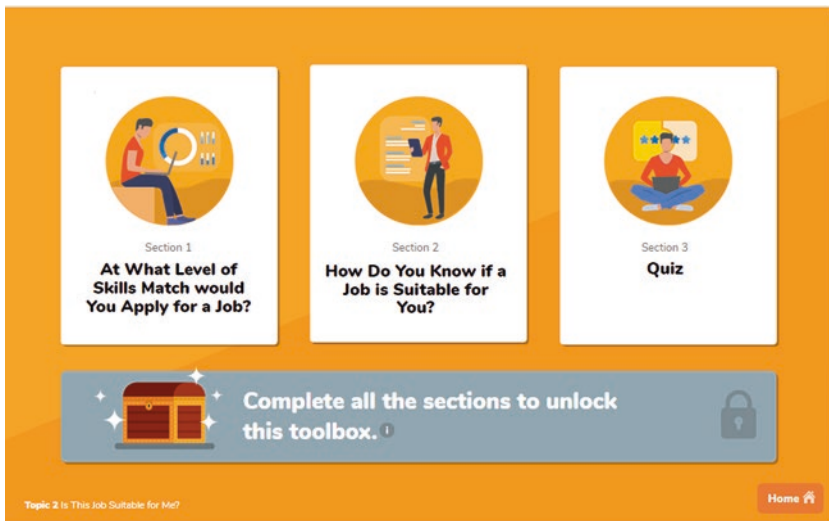
Fig. 2.1   The three sections in a sample CPD topic

The activities that students performed in each topic were varied to keep students' engagement level high. For example, in topic 7, line managers from a few companies provided advice on how to react to changes in job scope during an internship while in topic 8, the students had to choose their responses pertaining to how to respond positively to negative feedback at various junctures in a comic strip. Similarly, quiz activities could take the form of a drag and drop activity to fill in the blanks or to complete a jigsaw puzzle. An 'unlock the toolbox' feature was also included to motivate students to complete all the sections in a topic. The toolbox contained more career resources to aid students in their career planning. Students' engagement level was also kept high by keeping each topic bitesized. In topic 2, for example, the Readiness section was about 1.5 minutes long while the Discovery and Reinforcement sections were five minutes and two minutes long respectively.

Learner control with automated feedback and spaced review were built into each topic. We provided students with learner control as it increases students' engagement (Polasek & Javorcik, 2019). Students could decide on the sequence they wanted to cover the topics. Furthermore, we could provide automated feedback as the activities only allowed constrained responses such as filling in the appropriate blanks via options provided, true/false statements and multiple-choice questions. The activities were set to accept only correct answers with incorrect answers moving back to the answer options board. Spaced review was facilitated by allowing students to continue from where they stopped or to review the entire topic again. If they chose to review the entire topic again, the responses from the previous attempt were refreshed automatically and so they had a clean slate to practice and improve their skills, with fresh feedback.

Discussion

A blended learning approach was used for the Career and Professional Development module with physical classroom and online microlearning components. The microlearning component offered efficiency in terms of scalability and accessibility to students across programs. However, was the microlearning component effective in helping students plan their career?

A study was conducted with 80 Bachelor of Information and Communications Technology students taking the CPD module to determine whether there was a difference in the students' pre- and post-training survey scores after completing the micromodule and whether this

difference was statistically significant (Lee, 2022). The pre-post training survey results showed a statistically significant difference in the students' self-efficacy scores on career readiness. Furthermore, their open-ended responses in the surveys reflected specific plans to navigate career opportunities, identify their strengths, build positive working relationships during their internship and to engage in lifelong learning.

These positive results are undergirded by the planning conducted using the mapped framework in Table 2.1. The time spent in identifying the challenges students faced prior to and during their internship was worthwhile. Students could relate to the scenarios in the micromodule because they reflected authentic challenges that students might face during an internship and practical tips to overcome them. Furthermore, the development and design of the learning concept and content were kept interactive and varied for the three segments in each unit. Thus, students had something interesting to look forward to in each segment. In terms of participation and practice, students mentioned that they liked that they had control over what material to go through and receiving immediate automated feedback on their performance.

Conclusion and Recommendations

This chapter presented the author's journey in developing the Career and Professional Development micromodule to provide a scalable and effective e-resource to teach students how to plan and manage their career. The micromodule was planned based on Dolaskinsi and Reynold's microlearning model and Khan's e-learning framework and delivered using the blended learning approach. The learning outcomes were positive, reflecting that microlearning is a promising supplementary learning e-resource.

I would thus like to recommend a few best practices in the design and implementation of microlearning:

1. Microlearning needs to be designed in a learner-centric manner as it is performance focused. Adequate time should be factored in to gather information on the students' needs so that targeted support could be designed into the micromodule in terms of learning concept and content.
2. Students engage in self-paced, self-directed learning when learning with microlearning materials. Thus, the attrition rate could be quite high. To enhance student engagement and to motivate students to persevere in their learning, design and delivery issues need to be

considered simultaneously from the beginning of the development process. This is because microlearning material, once developed, is not easily revised or updated. Gamification features could help increase students' motivation to engage with the learning material. Similarly, microcredentialing could be considered, upon student's completion of a micromodule, to enhance the students' employability (Kohler et al., 2021). The toolbox feature could also be used as an avenue for tutors to keep the material updated as it is a feature external to the design of each topic.

3. The future of learning is shifting from a focus on earning degrees to developing skills; from a push paradigm where content is assigned to a pull paradigm where students have control over what, how and when they learn (Hamilton et al., 2021). Learner control allows students to decide how much content they wish to go through in the micromodule and at what frequency. Forcing students to go through all the topics amidst their tight curricular and co-curricular schedules does not ensure greater retention of the learning materials as their interest level in those topics might be low. The critical consideration is to tag the micromodule to a graded assignment which is performance based. The students will then have a clear learning purpose when going through the micromodule.

Going forward, microlearning via online means could have a positive impact on upskilling students and employees in work-based learning contexts. I hope that the lessons shared in this chapter will help tutors interested in teaching using microlearning embark on this meaningful journey as we grow with our students in the digital age.

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Changing to Online Teaching Successfully: Evidence from Student Learning

Renuka V. Sathasivam

INTRODUCTION

The pandemic-induced shutdown greatly impacted higher education institutions (Lee et al., 2021), as many switched to remote teaching (Kaur, 2020). The change of lesson delivery remotely and in advanced stages of the courses happened almost instantaneously. Therefore, substantial changes in pedagogy, assessment, classroom management and student motivation occurred (Lederman, 2020; Lee et al., 2021). Unprecedented, lecturers did not have the choice to resist. They had to adopt and adapt online practices for the continuity and sustainability of student learning. Many lecturers were not ready to take the plunge (Paliwal & Singh, 2020).

Lecturers believe online learning is inferior and offers little interaction with and among students (Ching et al., 2018). This, in turn, affected their attitudes towards online teaching and learning (Razkane et al., 2022). Thus, addressing teachers' beliefs during this disruption is necessary. If

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individuals believe in the reasons for the change and perceive that the new behaviour will result in a better state than the current one, they are more inclined to change (Berger, 2020). In contrast, if individuals do not believe in reasons to change, they are more likely to resist the change. One way to encourage lecturers to take the plunge and ensure more positive attitudes and beliefs towards online teaching is to examine their new practices and assess how they affect student learning outcomes. Guskey (1989, 2002) states that the key element in significant changes in educators' beliefs and attitudes is the clear evidence that their practices are improving students' learning.

In other words, lecturers' beliefs and attitudes towards online learning can only change if they can see that their online practices lead to positive learning outcomes. This autoethnographic qualitative research seeks to describe and analyse my online practices and see how these practices impacted student learning outcomes. Based on the evidence gathered, I reflect on my beliefs about online teaching and learning and how it helped me move forward with future challenges and innovations. Hopefully, this systematic study on change may benefit those who resisted online teaching and learning like myself.

Literature Review

Covid-19 demanded education systems and educators to change—adopting "Emergency Education"—transitioning from traditional face-to-face teaching to virtual pedagogies (Godber & Atkin, 2021). The landscape of higher education changed, creating challenges and compelling educators to develop creative initiatives to overcome the limitations of virtual teaching. Despite best efforts to transform from face-to-face to online, many intrinsic and extrinsic barriers and institutional inhibitors exist (Lloyd et al., 2012; Sumalinog, 2022).

Firstly, many lecturers believe online learning offers little interaction and lacks visual cues, thus redeeming them as inferior quality (Bao, 2020). Secondly, lecturers fear losing control. In the brick-and-mortar teaching paradigm, lecturers are the sole proprietor of the syllabi, teaching pedagogies and assignments. Shifting online requires technical and pedagogical input from various persons, such as videographers and instructional designers; the autonomous control for the course disappears (Dhawan, 2020). Lastly, lack of support and guidance from institutions, especially technical and pedagogical (Wilichowski & Cobo, 2020). Some

institutions gave lecturers the Learning Management System (LMS) with their access code to their online classes and expected them to conduct remote teaching without preparation (Dhawan, 2020).

These disruptions in pedagogy, assessment, classroom management and student motivation lie across a spectrum for each lecturer. For example, suppose lecturers had prior experience teaching online. In that case, they are more likely to be motivated to teach online during the pandemic (Horvitz et al., 2015). Similarly, lecturers understand the need for remote teaching and learning. However, they could resist it emotionally (Kin & Kareem, 2018) based on their feelings of concern about their readiness (Martin et al., 2019). Furthermore, lecturers may perceive forced online teaching as outside their comfort zone. The lack of teaching efficacy in the new context may cause negative attitudes about the changes demanded (Berger, 2020).

Many researchers consider teachers' professional knowledge as beliefs (Kagan, 1992; Tillema, 1995). Teachers' beliefs strongly influence their teaching practices (Pajares, 1992; Ramzan, 2021). Accordingly, what teachers think and believe shapes what they do and how they do it (Wu et al., 2011). Beliefs form the backbone of teachers' decision-making and classroom actions (Richards & Lockhart, 1994). However, teachers' belief systems are established slowly over time (Kagan, 1992). Therefore, when teachers are forced to do remote teaching, they do not have the relevant professional knowledge to deal with their new practices. Their belief systems must evolve to accommodate these changes.

Guskey (2002) proposed the Model of Teacher Change, stating that primarily significant changes in teachers' beliefs and attitudes occur after they demonstrate improvements in student learning. The model of teacher change is predicated on the idea that change is primarily an experiential-based learning process for teachers. When teachers change their practices and find them useful in helping students attain desired learning outcomes, they are often retained and repeated. Those changes that do not work or yield no tangible evidence of success are generally abandoned. This study adopted the model for this study. The adopted Model of Teacher Change is shown in Fig. 3.1.

The forced online learning due to COVID-19 compelled lecturers to do remote teaching. New practices must be formulated and implemented. As lecturers try new instructional strategies, they must approach their work with a change of orientation, constantly reflecting, evaluating, and experimenting with strategies and seeing how these practices affect
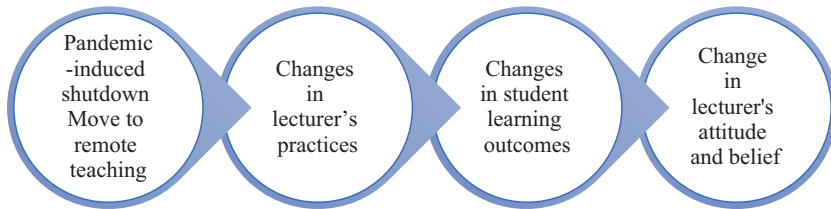
Fig. 3.1 Model of Teacher Change (adapted from Guskey, 2002)

student learning outcomes (Jónasson, 2016). The evidence of improvement or positive change in students' learning outcomes generally precedes and may be a prerequisite to significant change in most lecturers' attitudes and beliefs, as Guskey (2002) suggested. Thus, according to Hopkins et al. (1994), the reality of the change is not due to the strategy (even though it provides a framework for action) but how the implementation of the strategies is interpreted and applied by the students. Fenstermacher (1994) suggests that reflecting on one's work as a teacher must be undertaken within the framework of a clear sense of purpose concerning the learner. Known as the "mutual adaptation" approach, Klein and Riordan (2009) claim it is the best approach to create dramatic change, such as shifts in actions and beliefs.

In essence, demonstrable results in terms of student learning outcomes are the key to the endurance of any change in instructional practice. Attitudes and beliefs about teaching are largely derived from the classroom experience. In addition, learning outcomes should not be viewed solely as cognitive but also affective. Lecturers who experience students gaining better achievement, attendance, motivation to learn and involvement in class can shift attitudes and beliefs and try to retain these practices (Wickman & Ostman, 2002).

Online learning disrupts the teaching and learning ecosystem as highlighted in Moore's Theory of Transactional Distance. Moore (1993) articulates that the separation between teacher and students is not merely a geographic separation but a pedagogical concept. This means that although space seemed to be the most prominent characteristic of online learning, transactional distance influences the learner and the learning environment by three variables. These variables are dialogue, structure and learner autonomy (Moore, 1993). Depending on how lecturers regulate these variables will result in the transactional distance being higher or

lower. For example, if the lecturer prepared a very structured online learning environment, this reduces the dialogue between the lecturer and students, leading to higher transactional distance. If the lecturer's course structure involves tasks where students are given choices to solve various problems, then student autonomy is on the front burner. In contrast, if the lecturer has a highly structured task, students are compelled to follow the instructions given and lose their learning autonomy.

When lecturers move to online learning, they must reflect prior to the course about how much structure and dialogue they must prepare to ensure effective student learning. Educators must determine the pace, sequence and method of information giving and gathering. For example, lecturers provide students with digital notes, videos, and online chats to help the students master the content knowledge. The lecturers often upload all the content at once, so students can learn as and when they want. However, students often do not have the skills to sift and process through the enormous amount of information at once. This can lead to cognitive overload, reducing student working memory capacity.

To reduce the cognitive load, lecturers can encourage online peer learning. Peer learning is closely linked to student engagement and the co-production of knowledge (Lee et al., 2017). However, Rasheed et al. (2021) explained that the main challenge in remote learning is online peer learning. Online peer learning only works well when four essential features are considered: activities, choice, facilitator support, and community (Nerantzi, 2020). Peer assessment can enhance the efficiency and quality of learning. However, online peer assessment requires a technological medium to give feedback, and this increases the transactional distance and raises the possibility of social conflict that can negatively impact knowledge construction.

METHOD

This study employed an autoethnographic qualitative research design. I reflected on my teaching practices to describe and systematically analyse how these practices affected seven students' learning experiences and outcomes. I used various qualitative methods to generate and collect data to examine my practice and look for critical incidents throughout this period. The data included—google meet recordings, documents created by the students, assignments, reflections, professional observations, and conversations with students. Each of these captured the complexity of the

teaching practice, allowing me to scrutinise the changes in my practices and examine them critically. I examined how these changes in practice affected and influenced student learning (LaBoskey, 2004).

The data were inductively analysed using the constant comparative method (Glaser & Strauss, 1967; Thomas, 2003). I reflected on my retrospective practices with the current one. I looked at critical changes, how I reacted to them, what decisions I made, and how they affected student learning outcomes. To examine my practices, I adapted the Four R's Professional Inquiry Model (Recognition, Reflection, Reaction, and Results) by Loose and Ryan (2020) to help make meaning of my practices. Figure 3.2 shows the adapted Four R's professional inquiry model.

The Four R begins with the recognition of a critical incident, in the context of this study, a change in the outcome of my practices due to remote teaching. I reflected on the incident (either immediately or delayed) while being sensitive to the practice adjustments and students' needs. I reacted to these reflections by adapting and modifying practices which meant, in some cases, changing teaching materials, learning environment, or nudging students to learn. Finally, I analysed my altered practices and monitored the influence of these changes on student learning outcomes. This model helped make meaning of the data by examining the challenges faced, the decisions taken, and how they impacted student learning.

Fig. 3.2 The adapted Four R's professional inquiry model (Loose & Ryan, 2020)
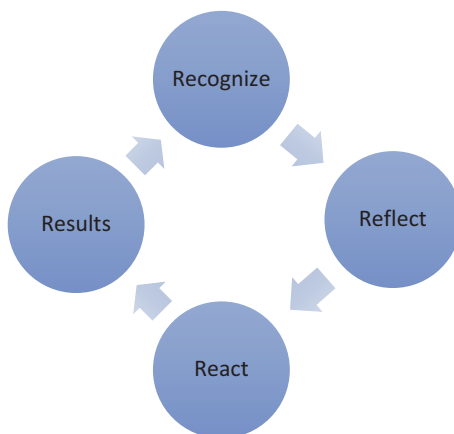
Prelude to the Change

Contemporary Issues in Science Education (CISE) is a core course for a Malaysian public university Master of Science Education. The students comprised in-service science teachers who taught at diverse institutions—schools, colleges and as private tutors. Before the pandemic-induced shutdown, the class was conducted face-to-face, meeting for three hours per week for 14 weeks. The chronological events that took place for this course were as follows. In the first lesson, the students discussed the current issues and any others they would like to know. I gathered these ideas and decided on a timeline for the presentations. In the next class, students look through the timeline and decide which two issues they would undertake in groups. They were given time to search for materials. Each group met with me to discuss the materials and their presentation ideas. I provided constructive feedback and suggestions, but these were not mandatory. This process took about three weeks.

In the subsequent weeks, each group took turns to present its issues. The groups were given two hours to discuss the issues, teachers' current practices of the issue, and how to obtain ideal practices. Generally, students' presentations consisted of PowerPoint, interactive activities, and quizzes. I usually participated in these activities as their peers. At the end of the course, each group wrote a chapter based on their presentation, which was compiled into a book. The students also did peer assessment—assessing peers' contributions to the learning events of the course.

The CISE structure was rooted in autonomy, competency, and relatedness (Ryan & Deci, 2000). The students had the autonomy to choose their group members, their topics and how they wish to present their ideas. The students read materials about the issues and discussed with me to clear any doubts through constructive feedback. This process helped them gain competency in the subject matter. The students worked in groups, devising strategies for their presentations, and preparing for their book chapters. They communicated and collaborated to ensure a successful outcome—therein the relatedness.

The course shifted online when the lockdown was imposed, and I was lost. I am not technology-savvy, and all these apps and technical aspects were overwhelming. Reviewing my course learning outcomes and previous experiences, I admitted that the course was conducted efficiently. Thus, there existed an inertia within me to change. I decided not to

change the course's activities or chronological events, and the course would just be carried out remotely.

Results

The findings are divided into three sections. Firstly, I elaborate on four key changes between my pre- and post-pandemic practices. Secondly, I highlighted students' testimonials about their learning experiences and, finally, I reflected upon my change in beliefs.

My Changed Practices: The Four

The noteworthy four change practices were dialogues through transactional distance, cognitive overload when searching for materials, dwindling interest during peer learning, and an atomistic approach towards peer assessment. These four changes will be discussed in the following sections.

Dialogues Through Transactional Distance
In face-to-face lessons, my mannerism and tone of voice, which students visually get to see, played a significant role in making students feel comfortable expressing their ideas. I recognised at once that this aspect of my practice disappeared when conducted online. Due to internet connectivity issues, many do not turn on their cameras. Students preferred to keep quiet and were unresponsive. The absence of facial expressions and non-verbal interactions made it difficult to understand students' moods. I altered my practices by trying harder to verbalise these mannerisms. For example, asking them, "What do you mean when you said that – that is so unusual?" or "I'm thrilled now – the effort you put in was incredible". By verbalising my actions, I hoped to encourage students to feel comfortable interacting with me. After doing this, I discovered that students were more open to expressing doubts or asking for clarification.

However, I soon realised that verbalising non-verbal cues made it seem that I am dominating the conversations. Not only did I need to tell them the content but also to express my mannerisms verbally. Sometimes, telling them the content and leaving the mannerisms and feelings out of the conversations felt easier. It cannot be denied that there were some frustrations in balancing the extended dialogues and ensuring students had autonomy in learning. I did not want to be omnipresent, so I repeatedly

reminded the students that these sessions were primarily co-construction of ideas.

Cognitive Overload When Searching for Materials
In giving students autonomy and competency, students in this course were asked to look for presentation materials. In previous cohorts, students had many outlets to gain this information. When they came to share their ideas, I noticed a variety of materials from various sources. Some were hard copies from the library, conversations with teachers in their schools, and even classroom observations of their students. During online teaching and lockdown, many students' source of information was the internet. I had anticipated this problem and thus, had uploaded some key materials for each of the topics the students were researching. One student commented that these materials became the starting point to search and compile their materials.

> When I typed personalised learning, there were about one million hits. … It was easier looking at the uploaded material, reading, and understanding the concept before searching for more materials. It helped us focus on the materials we needed to look for…

I had the foresight that students might encounter cognitive overload when researching materials. I thus provided key papers/studies to help them manage their search better.

Dwindling Interest During Peer Learning
Previous cohorts designed their presentations with activities, PowerPoints, games, and quizzes. In contrast, this batch of students had to do their presentations using PowerPoints and online games and quizzes like Kahoot and Quizizz. As they presented, I noticed that the online games were generally lower-order questions, and their peers were not engaged. Moreover, learning seemed to be one-way and depended on lecture mode. I did not know how much their peers listened to the presentation with the cameras off.

I intervened halfway and told the class that the presenting group would give two open-ended questions about their presentation. Therefore, they must focus on the presentation to answer these questions. As students knew they were held accountable, many started asking questions when they were in doubt. Some examples of questions asked by the presenters

were, *(1) What strategies do you use to assess your students during this pandemic? Discuss* and *(2) Which Visible Thinking routine would you use in the classroom? Give your reasons.* Interestingly, these questions were good; however, since I had not factored this aspect in, there was not much time to discuss them.

An Atomistic Approach Towards Peer Assessment
Peer assessment was conducted at the end of the course. A small percentage of marks was allocated as it was fair to see how students contributed to the learning experiences of their peers. In the previous cohort, these students were asked to assess their peers' contributions holistically for the entire course. The assessment included content contribution, participation, interactions, and work ethics. In this cohort, I discovered that the students assessed their peers mainly on their vocal contributions. The reasons they gave for assessing them lowly were 'quiet', 'silent', 'rarely spoke' or 'did not give any suggestions'. The online delivery mode provided the students with a narrow understanding of their peers' contributions. They were deemed uncooperative in the learning process because their 'voices' were not heard . Only one student commented, "I personally would not want to put anyone as the bottom scorer as I feel that each has their own ways when it comes to class interactions".

In face-to-face lessons, students can experience various ways their peers contribute to the final project. Even though these contributions might be minute in nature, students appreciated these in the physical mode but not online. As this was done at the end of the course, there was not much that I could do. However, in the future, for online mode, I believe more instruction must be given to show students how peripheral work can contribute to the overall outcome of the learning process. They should include feelings and approaches those peers contributed towards the interactions and cognitive contributions.

Students' Learning Outcomes: What's the Verdict

The students in this course endured many challenges as they also had difficulty facing the pandemic. Generally, the students punctually showed up for all the classes, engaged in dialogues, completed their assignments, and prepared an e-book on Contemporary Issues in Science Education. Some were truly excited that they had managed to create an e-book.

Who would have thought I could write a book? The presentation we did help us to write a book, and I am quite proud of myself.

In the course evaluation, students gave positive comments. A few students admitted that the course felt demanding at the beginning. However, they were able to complete it because of the scaffolding provided.

The 2 hours presentation we did for the topic assigned was initially hard but looking at what I have accomplished now, … I understand her (Dr Renuka) intentions are right, and she did the right thing. Her classes were very much engaging and professional. … Dr Renuka was willing to allocate time, check on us and ensure that we were on the right way of learning. The course was entirely very helpful and made adult learning so much fun.

Students also claimed that the course instils interest in science education issues and want to know more as they find it useful in their teaching profession.

I have learned a lot in this course… looking forward to learning more about it and practising and applying it in my future teaching.

Students also realised that student learning difficulties are more than just a cognitive issue, and they must be addressed holistically.

This course has taught me to stop and look at my students and dig deep into what may be troubling them beyond my subject. … given me many insights on the cognitive and the affective aspect of my students.

DISCUSSION

As I was preparing initially for online course delivery mode, I was resistant to change. At that time, I believed that face-to-face provides optimal learning experiences. My inertia towards this change was reflected in these questions—*why change when the course outcomes had been encouraging?* And *why reinvent the wheel?* Moreover, I would never have done this transition if I had been given any other choices. Even during the compulsory online teaching, I kept the course structure and activities intact, only changing the mode of delivery. There was fear and anxiety. After undergoing one cohort of online teaching and using that as a platform for reflection, my attitude towards online learning has changed tremendously.

Examining my practices and how they influence student learning has exposed the highlights and downfalls of migrating to online learning. More importantly, the positive feedback the students provided cemented my views about my capabilities as a lecturer and the adaptive strength I have if I put my mind to it. In line with the Model of Teacher Change (Guskey, 2002), I believe this experience can sustain my online practices.

The four changed practices had different impacts on student learning. The transactional distance due to online learning requires pedagogy modifications. Lecturers must be aware of the three components of transactional distance and balance them appropriately to achieve effective online learning experiences. The dialogues became lengthier in my course because I had tried to compensate for the lack of visual mannerism by expressing those ideas in words. However, there are many ways of not using verbal cues to check in with students. For example, I could have used emojis to express my mannerisms and get feedback on how students felt about the lesson.

Though I anticipated that students would have a cognitive overload, my pace (structure) for my online classes was not well done. Face-to-face activity's pace can be very different when conducted online. Thus, in the future, I need to constantly test parts of the course on a pilot group of students to find out precisely how much time each student will need to accomplish the lesson's objectives and which aspects of peer learning online is more effective compared to face-to-face peer learning. Like in physical classrooms, I may still run out of time, but I can ask them to do a podcast to explain their answers or a one-minute TikTok video about the highlights of their peers' presentations. I can evaluate these videos and provide feedback.

Both the peer activities—learning and assessment—needed to be upgraded. Rasheed et al. (2021) stated that peer activities are the main challenge during online learning. I need to prepare a template where students can write their contributions towards the tasks. After completing the template, students pose on the social media platform, where their peers' can view their contributions and make better judgments about the work (Tervakari et al., 2012). I also believe that online peer activities are difficult because of the lack of social-physical interactions, leading to mistrust among students. As we build this trust, students can only start giving honest and constructive feedback (Ye, 2014). Instead of diving straight into the course content, time must be allocated for ice-breaking activities.

Games like 'three truths and one lie' can help students 'see' their peers in their element.

Teaching is currently blended; thus, my attitudes toward online learning are still positive. However, when classes move completely face-to-face in the future, there might be a chance I might regress to my old teaching practices, deeming some current practices unsustainable. Some classroom activities, especially peer learning, may require in-class sessions to help students with their communication skills. However, I appreciate how flexible my lessons are now. I have learned to upload videos so working students can attend my classes remotely. I use technological tools to give frequent feedback and communicate with my students. I am confident that technology can play a bigger role in my teaching.

This autoethnography research captured my experiences with online learning and how it affected student learning outcomes; however, there were limitations. Firstly, the researcher's honesty and willingness to self-disclose are important because it exposes one's feelings and thoughts. To that end, I have had numerous discussions with the participating students to get a 'reality' of the research context. Secondly, the participating students were small in number and were already motivated as postgraduate students. The positive student learning outcomes could be because students were autonomous and could achieve the learning outcomes, not solely by my changed practices.

Conclusion and Recommendations

In 1973, Morimoto claimed that "when change is advocated or demanded by another person, we feel threatened, defensive, and perhaps rushed. … Pressure to change, without an opportunity for exploration and choice, seldom results in experiences of joy and excitement in learning" (p. 255). That is what happened to most educators that were forced to do remote teaching during the pandemic-induced shutdown. Stepping outside our comfort zone and challenging ourselves to change can bring opportunities for enhancing practices (Brown et al., 2021).

Any teacher practice changes are only sustainable if teachers have a belief change (Guskey, 2002, 2018). The continuity of these practices will occur if teachers can positively see how their practices affect student learning outcomes (Berger, 2020). Analysing these practices and relating them to student learning outcomes through mutual adaptation can change one's beliefs about the new practices and see them as sustainable (Klein &

Riordan, 2009). As our competencies advance, we are more confident, which motivates us to continue improving for the sake of our students.

There are several implications for this study. The first implication is for lecturers. Lecturers can be agentic and take opportunities for changes when they arise (Guskey, 2020). For online teaching, lecturers must read-just the dialogues-structure-learner autonomy aspects of their course materials and know-how reducing or increasing one aspect can affect the others. Therefore, lecturers must understand that sustainable changes involve not only their practices but also their understanding of students' backgrounds, values, and interests. The second implication is for university systems/management. They should anticipate that lecturers would be concerned when changes or new policies are introduced. University systems should support change in beliefs about online learning among educators by investing in proactive resilience initiatives (Rapanta et al., 2020). Thus, they should put support in place, such as professional learning communities, resources, and time to answer questions and support lecturers in changing practices. The third implication is the students. Students must understand how important their input is for teachers to implement good online practices. The students must be prepared to give honest feedback so teachers can change their practices to accommodate their students' needs. Moreover, students must learn to speak clearly and precisely when giving feedback or suggestions; lecturers can only respond and change their practices accordingly.

I would like to end this chapter with suggestions for when lecturers encounter new policies or changes. Firstly, have a positive or growth mind-set about the changes. Secondly, understand the underpinning theories holistically and why the new policy or change is needed. Enlist the help of like-minded colleagues to discuss and evaluate the changes. Thirdly, make the necessary pedagogical changes to implement the changes. Remember to insert activities to collect student feedback about their learning and your teaching. Lastly, prepare a safe learning environment for honest conservation with your students about what's working and what's not. Listen and understand student learning needs and address them. This will ensure positive learning outcomes for students and can lead to lecturers' changes in attitude and belief.

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The Use of Learner-Centered Pedagogies and E-Portfolios to Facilitate Pre-Service and In-Service Teachers' Development in an Asian System

Fan Huang, Emily Pey-Tee Oon, and Spencer Benson

Background

Implementation of new and innovative pedagogies leading to teaching and learning excellence is handicapped by the lack of firsthand experience of teachers in their own learning journey as students and novice teachers who are accustomed to designing learning activities based on how they were taught which traditionally involve didactic content delivery pedagogies (Ali, 2020; Chen et al., 2011; Huang et al., 2020; Lai et al., 2016).

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This results in instruction and learning that is primarily passive and focused on content, rote memory, and lower-level cognitive skills. In contrast, instruction that includes active learner-centered learning through engagement, shared responsibilities, and assessments involving higher-order cognitive skills (Anderson & Krathwohl, 2001; Angelo & Cross, 1993; Choi et al., 2019) leads to deeper and enduring learning. The former results in misalignment with current educational goals that focus on how students need to learn and how teachers need to teach using learner-centered pedagogies. When education relies primarily on traditional didactic teacher-centered pedagogies and assessments, it compromises current and future students' success and society's advancement. One means to address this issue is to ensure that K–12 pre-service and in-service teachers experience and model active learner-centered pedagogies that include self-learning, peer instruction, empowerment, and appropriate use of educational technologies that foster creativity, personal growth, enduring understanding, and modern approaches to education. Hybrid active learning pedagogies and e-portfolios coincide with the introduction of online lessons and provide a way to address current and future educational needs and leverage the benefits of technologies and online learning.

Across many disciplines, portfolios foster student learning and self-motivation (e.g., Knowles, 1975); facilitate self-reflection (Amaya, et al., 2012; Klenowski, 2000); and cultivate independent learning (e.g., Klenowski, 2000), development of self-satisfaction as a future professional (e.g., Sherry & Bartlett, 2005), and transformational learning experiences (e.g., Tosh et al., 2006) associated with active learner-centered pedagogies that facilitate deep learning (Barrett, 2004, 2006; Faulkner et al., 2013; Marín, 2020). In addition, portfolios serve as a tool for documentation, reflection, and presentation of students' work illustrating what they learned (Barrett, 2004, 2006). They can be used to support the assessment of/for/as learning (e.g., Amaya et al., 2012; Boileau, 1993; Klenowski, 2000) that documents the achievements and practices of pre- and in-service teachers (Centra, 1993; Urbach, 1992; Webster, 1992) in authentic settings (Barton & Collins, 1993; Shulman, 1987, 1988). Electronic portfolios (e-portfolios) allow the integration of audio, video, graphics, and text and have the added advantages of being easily modified, transportable, and shared across time and spaces facilitating creativity and progressive development (Faulkner et al., 2013; Marín, 2020). The purpose of using e-portfolios in the current study was to facilitate, document, and assess student learning using student online e-portfolio products to

foster deeper learning and self-awareness and break the cycle of traditional teacher-centered didactic education. In the current study, in- and pre-service teachers documented and reflected upon their learning through various e-portfolio activities, which served as a roadmap for their learning, their development as educators, and as means for assessment and course improvement.

Research Objectives

In this chapter, we explore the use of e-portfolios and online learning in pre- and in-service teacher education at a research-intensive premier Asian University in Greater China. To investigate the impact of e-portfolios on facilitating students' professional development, we seek to address the following research questions (RQs):

Does the use of e-portfolios foster deep learning through learner-centered pedagogies by helping them to:

RQ 1: document their learning?
RQ 2: engage in self-directed learning?
RQ 3: receive feedback from their peers?
RQ 4: increase motivation for learning and use of online technologies?

Methodology

Student Demographics

A total of 67 students in three cohorts across two academic years participated in the current study. The first cohort, PG-1a, was in-service postgraduate students (25 students, Fall 2017) in a required postgraduate course, the second cohort, UG, was pre-service undergraduate students (26 students, Spring 2018) in a required undergraduate course, the third cohort PG-1b (16 students, Fall 2018) were in the same PG course taken by the first cohort. The undergraduate students comprise a uniform age group and students had experiences using e-portfolios in their residential colleges. The postgraduate students are practicing teachers of various ages and teaching experience but had minimal experience with e-portfolios. Among the three cohorts, there were 16 males and 50 females, one did not specify their gender. Each of the courses met once a week for a

three-hour period and involved web-based learning activities via Moodle and Mahara (https://mahara.org/) learning management systems.

E-Portfolio Weekly Entries

During the 14-week course, students did weekly online e-portfolio entries which are shared with the class and monitored by the instructor. Following each of the class meetings, students documented their learning (RQ1) on their individual e-portfolios using Mahara. The e-portfolio entries encourage students to engage in self-regulated learning (RQ2), reflection, and peer feedback (RQ3). All students' e-portfolios were shared with the instructor and other students in the class. Students were encouraged to reflect and comment on their and their peers' e-portfolios postings in order to motivate each other to learn (RQ4). Student posts on the e-portfolio served as the basis for the course assessments and grades. Student e-portfolios were graded using a rubric (see Appendix A) based on the three course learning components (learning theory, assessment, and pedagogy), their reflections, peer sharing, and the overall quality of the e-portfolio products. The overall quality and quantity of the e-portfolio posts comprised 20% of the total course grade of the course, attendance and participation, 10%, two group projects, 30%, two individual assignments, 40%. All projects and assignments were submitted as postings (pages) in their e-portfolios.

Examples of Course Component Learning Activities' Postings on E-Portfolios

The purpose of e-portfolios is to showcase students' works, which aims to seek feedback from their instructors and peers. (1) For the learning theory module, students constructed at least one learning objective pertaining to four learning theory schools (behaviorism, cognitivism, constructivism, and connectivism) and posted their learning objectives on their e-portfolios as documentation of their learning. For example, a student framed a learning objective on constructivism: "Using materials they commonly seen in daily life to explain the diffraction of light" with the following context:

UM Open day is approaching. Many visitors are going to visit UM. As student teachers, you want to show the public how creative you are as students releasing your talents in multiple aspects, art including!

With a minimum cost, create artwork of light use of materials available to you through mediums understandable to your audience.

You will be given a room/corner at FED to display your artwork of light during the open day!

(2) For the pedagogy module, students designed learning activities that aligned with their proposed learning objectives and supported the intended learning outcome. The learning activity artifact was shared in their e-portfolios (see Fig. 4.1).

(3) For the assessment module, students designed an assessment to measure if their intended learning outcomes were achieved through the learning activities. In addition, as one of the learning projects, students were charged to design a new type of report card that showed student learning and achievement. See Fig. 4.2 as an illustrative example of a typical assessment construct e-portfolio posting that allows students to showcase their creativity on the online platform.

Fig. 4.1   Prototypes students built to attain the learning objective

Fig. 4.2 Prototype of report card students build on assessment for learning

(4) Students were encouraged to post on their e-portfolio sites following each class meeting. These postings served two purposes: (i) student self-organization of content and knowledge, and (ii) as formative and summative assessments for the instructor. An essential component of portfolios is the students' reflections which aid in self-learning and motivation. Below are representative student responses to showcase their reflections on the platform:

"We were born in traditional Chinese culture. We were fostered to be calm, obedient, and passive in learning. Comparing to Western culture we have all gone through the stages of re-reading, copying, and reciting. We got good scores, even though we actually know nothing about the topic. This is real it happens at least on myself. Although we cannot change the whole picture by a single move as a teacher, we should never give up on trying and craving to be a better teacher."

"Before the first lecture, I think learning is that students just need to listen and do some deliberate practices (homework), and students will be able to understand the knowledge by memorization. After this lesson, I know I am very shallow because learning does not just depend on student abilities, also rely on how teachers ask question, and what is the teacher's motivation (guided by the syllabus)."

Data Collection Procedures and Survey Instrument

A survey instrument designed by the authors was used to collect student data on the course quality and the use of the e-portfolios in fostering their learning and in addressing RQ1–RQ4 (see Appendix A). The survey is divided into three sections. The first section asked for student demographic information and familiarity with e-portfolios. The second section contained four survey items assessing student perceptions of the utility of the e-portfolio. All four items used a six-point Likert-type response format (1 = strongly disagree, 2 = disagree, 3 = slightly disagree, 4 = slightly agree, 5 = agree, 6 = strongly agree). The third section consisted of four open-ended questions to collect qualitative data:

a. Please explain how the e-portfolio exercises help you learn in this course.
b. What aspects of the e-portfolio were most beneficial, explain?
c. What aspects of the e-portfolio were least beneficial or could be eliminated, explain?
d. Is there anything else you would like to add with respect to your experiences with the e-portfolio or this class?

The survey was anonymous and administered electronically in both English and Chinese. All students completed the survey which provided insights and data related to the use of e-portfolio to enhance student learning. Specifically, we focused on whether the use of e-portfolio fosters deep learning by helping students document their learning, engage in self-directed learning, receive feedback from their peers, and increase motivation for learning and the use of online technologies through learner-centered pedagogies.

Data Analyses

Survey items assessing student perceptions of the utility of the e-portfolio were imported to Winsteps software version 3.81.0 (Linacre, 2014). Open-ended student responses were translated into English for analysis by the authors. All comments were read and coded into representative categories and quantitated. Student qualitative response data were coded so as to identify the emergent categories using the grounded theory approach (Strauss & Corbin, 1998). In this approach, the categories emerge naturally from the data through engagement and re-engagement with the data and the survey questions. We grouped the students' responses into categories. The coding was done by the first author and checked by the second author for consistency. An agreement was achieved between the authors concerning the categories that emerged from the initial stage of coding. Representative student e-portfolio examples were selected to illustrate student products and creativity for each of the course components, learning theory, assessment, and pedagogy. Research ethics for the current study were evaluated and approved by the ethics panel at the University of Macau before data collection. All identifying student data were removed prior to analysis by a third party.

Data were evaluated by the Rasch rating scale model (Andrich, 1978) explicitly hypothesizing an invariant relation between student agreeability and survey item difficulty:

$$P_{\text{nik}} = \frac{e^{\left(B_n - D_j - F_k\right)}}{1 + e^{\left(B_n - D_i - F_k\right)}},$$

which says that the probability of any person choosing any given category on any item as a function of the agreeability of the Person n (B_n) and the endorsability of the entire item i (D_i) at the given threshold k (F_k) (Rasch, 1960; Wright & Masters, 1982; Andrich, 2010).

RESULTS

Psychometric Validation Results of the Survey

In the Rasch analysis, we transformed the raw scores into logit values from 0 to 100. Because the absence of negative values is easier for readers to

understand and make comparisons. We reported Sect. 3.1.1 Reliability, Sect. 3.1.2 Fit Statistics, and Sect. 3.1.3 Wright Map under Sect. 3.1 Psychometric Validation Results of the Survey. They are indispensable components to checking the quality of data.

Reliability
We imported the survey data into the Winsteps software; the results showed that the Pearson reliability of the survey is 0.85 and item reliability is 0.93, which suggests that the survey has high consistency in measuring student perception of course quality and e-portfolio usage.

Fit Statistics
In the Rasch analysis, fit statistics assess the extent to which the data have been modeled by the strict mathematical expectations of the Rasch model (Bond & Fox, 2015). Only items that fit the Rasch model define a common construct—in the present study, this would mean student perceptions of the utility of e-portfolio. To investigate item fit, the infit for each item was examined. Infit statistics characterize the degree to which the observed randomness agrees with the statistical expectation based on the model. In general, the infit values are expected to lie in the desired range between 0.60 and 1.40. In the current study, the highest infit is 1.36 from Q1 and the lowest infit is 0.66 from Q4 (see Table 4.1). All items show good fit. Thus, the data fit the Rasch model in this study, which indicates that the underlying construct could be measured by these items.

Table 4.1 Question difficulty and fit statistics

Question	Measure	SE	INFIT		OUTFIT	
			MNSQ	ZSTD	MNSQ	ZSTD
1	38.60	1.61	1.36	1.75	1.35	1.37
2	44.30	1.57	0.81	-0.99	0.82	-0.79
3	54.10	1.44	1.10	0.61	1.10	0.61
4	52.27	1.46	0.66	-2.13	0.61	-2.29
Mean	47.32	1.52	0.98	-0.2	0.97	-0.3
P.SD	6.24	0.07	0.27	1.5	0.28	1.4

Wright Map

The Wright Map is a bar chart showing the hierarchy of student agreeability and survey item difficulty. The overlap degree of the student agreeability and item difficulty indicates the appropriateness of the scale (Hong & Wong, 2005). According to the Wright Map (see Fig. 4.3), the mean of students' agreeability is higher than the difficulty of the items, which shows a high level of students' agreeability on the use of learner-centered pedagogies and e-portfolio. As we discussed in Sect. 2.4 Data analyses, less

```
MEASURE                                   |                        MEASURE
 <more> --------------------- PERSON  -+- ITEM  ---------------- <rare>
   100                          XXX     +                         100
                                      T |
                                        |
                                        |
    90                        XXXXXX     +                          90
                                        |
                                        |
                             XXX        |
                                        |
    80                                   +                          80
                                      S |
                             XXX        |
                                        |
                                        |
    70         XXXXXXXXXXXXXXXXXX        +                          70
                                        |
                                        |
                                        |
                          XXXXXX        |
    60                                M+T                           60
                                        |
                        XXXXXXXXX       |   Q3
                                      |S
                                        |   Q4
    50                         XXXX     +                           50
                                        |
                                      |M
                             XXX        |
                                        |   Q2
                                      S |
    40                           XX    +S                           40
                                        |   Q1
                                        |
                             XXX      |T
                                        |
    30                           XX     +                           30
                                        |
                                        |
                             XXXX       |
                                      T |
                                        |
    20                                   +                          20
 <less> --------------------- PERSON  -+- ITEM  ---------------- <freq>
```
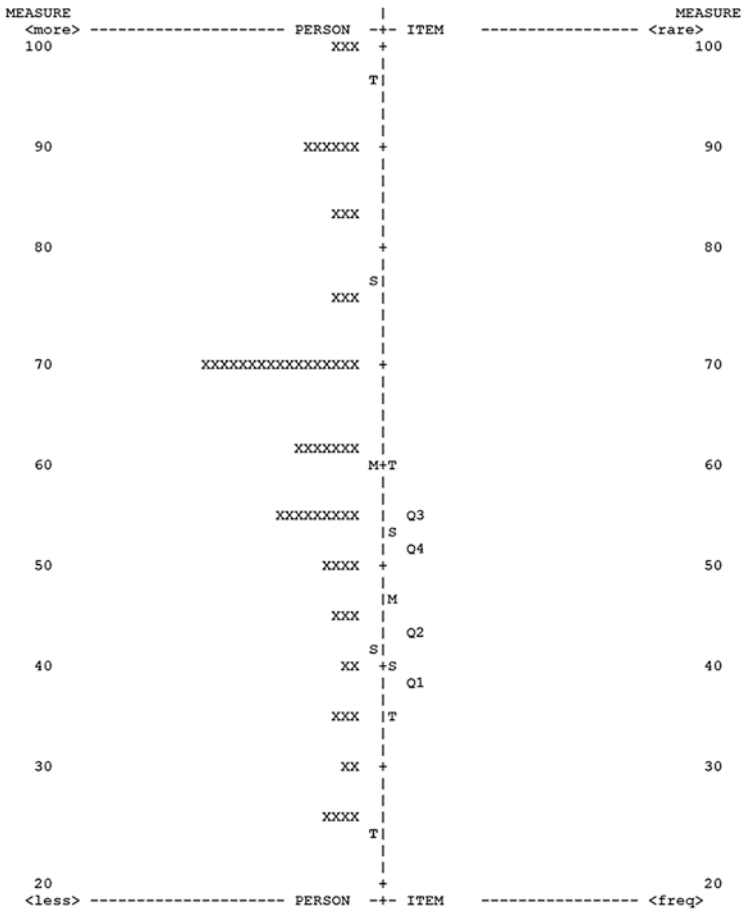
Fig. 4.3 Wright Map

difficult items (at the bottom of the Wright Map) are reflective of higher levels of students' agreeability on the utility of e-portfolio (see Appendix A), and more difficult items (in the upper part of the Fig. 4.3) indicate lower levels of their agreeability.

Student Evaluation of the E-Portfolio Usage

The intended purpose of the e-portfolio was to facilitate deeper learning and a better understanding of learner-centered teaching, increase student engagement via active learning and introduce the students to cutting-edge learning technologies. To assess the degree to which the e-portfolio accomplished these goals, we used the survey questions and the open-ended response questions a through d. Figure 4.4 shows the aggregate survey results for the three classes. For questions 1 through 4, there were different levels of agreement for all three cohorts with logits of 32.81 (PG-1b, question one: The e-portfolio exercises help me to document my learning in this course) to 57.01 (PG-1b, question three: The e-portfolio exercises enable me to receive feedback on learning from my peers.) (see Fig. 4.4).

	1. The e-portfolio exercises help me to document my learning in this course.	2. The e-portfolio exercises help me to participate more actively in class.	3. The e-portfolio exercises enable me to receive feedback on learning from my peers.	4. The e-portfolio exercises motivate me in learning.
PG-1a	37.34	44.89	55.09	51.96
PG-1b	32.81	47.21	57.01	52.25
UG	41.45	42.58	52.12	53.13
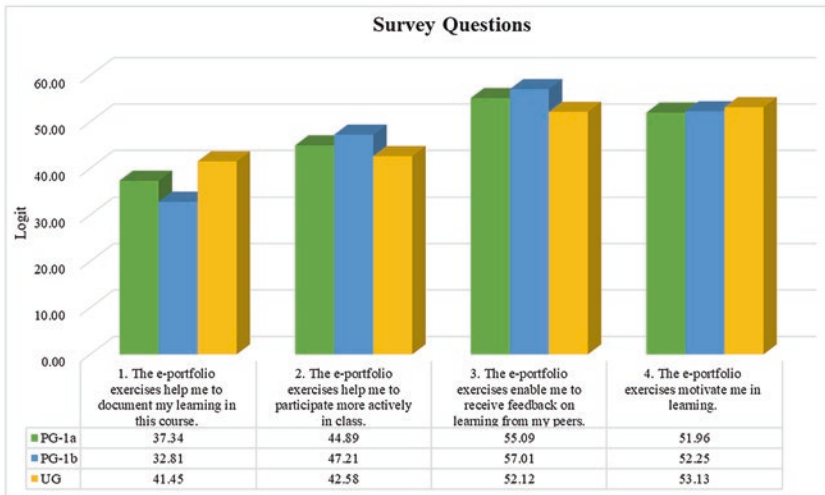
Fig. 4.4 Results of survey questions on student evaluation of the use of e-portfolio

Table 4.2 Coding summary of student free responses from the three courses from open response items

Identifier term	PG-1a	PG-1b	UG	Total
Document/Record	9	3	11	23
Review/Reflect	9	2	9	20
Organize/Construct	5	8	12	25
Learning	9	4	10	23
Share	8	5	2	15
Motivation	0	0	0	0

Research Question 1: Students in all three cohorts agreed that the e-portfolio helped them to document their learning. RQ1 has the strongest overall agreement with logits greater than 32.81 logits. One explanation for the high level of agreement is that students routinely documented their learning via weekly entries into their journal e-portfolios. This is also supported by analysis of individual student open-ended responses (Table 4.2 Coding of free response item a: *How the e-portfolio exercises help your learning in this course*), words such as document, record, review, and reflect were highly represented. The journal e-portfolio provided a structured mechanism to encourage students to revisit, review, and record the questions, information, concepts, and learning activities that constituted the 180-minute class meetings. Research Question 2: A higher logit on an item is associated with a higher probability of agreement with the item in the Rasch model (Bond & Fox, 2015). Students in all three cohorts agreed that the e-portfolio helped them more actively participate in the course learning activities, RQ2 (see Fig. 4.4). For question two, the measure was 44.30 logits, only 9 out of 67 students (13.4%) indicated any level of disagreement. The high level of agreement presumably reflects on the course structure which involved significant student group work and presentations which were documented via entries in the e-portfolio.

Research Question 3: Students in all three cohorts agreed that the e-portfolio helped them receive feedback from peers (RQ3), although this aspect had the lowest level of agreement. For RQ3, the measure was 54.10 logits with PG-1b having the lowest overall level of agreement (57.01 logits) with 4 out of 16 students (25%) expressing some level of disagreement. A similar pattern was seen for PG-1a (55.09 logits) in that 5 out of 25 (20 %) expressed some level of disagreement, however, a higher percentage (20 out of 25, 80%) of these students agreed or strongly agreed

that the e-portfolio helped them receive peer feedback. The UG cohort had the highest degree of agreement (52.12 logits) with only 2 out of 26 (8 %) of the students expressing some level of disagreement. One explanation for the higher level of agreement for the UG students is that they had experience with e-portfolios in their residential colleges (RC), which requires all students to maintain e-portfolios to document their RC activities.

In the analysis of the individual student's opened-ended responses (see Table 4.2), words related to sharing were asymmetrically distributed across the three classes with them being more common in PG-1a (count of 8) than the other two cohorts, with counts of 5 for PG-1b and 2 for UG. This difference may reflect differences in student experience with e-portfolios and the fact that PG-1a was the initial course where e-portfolios and linked pedagogies were used. Note that very few individuals in PG-1a (2 out of 25, 8%) and PG-1b (3 out of 16, 18.8%) have previously used an e-portfolio, whereas nearly all the UG had (25 out of 26, 96.2%). Since the e-portfolio platform allows all students to see each other's e-portfolios and provide feedback, the low relative score for this question may reflect age differences between the three classes.

Research Question 4: Students in all three cohorts agreed that the e-portfolio helped to motivate their learning (see Fig. 4.4). For RQ4, the measure was 52.27 logits with PG-1a having the highest level of agreement (51.96 logits) with 5 out of 25 students (20%) expressing some level of disagreement. A similar pattern was seen for PG-1b (52.25 logits) with 4 out of 16 (25%) expressing some level of disagreement, however, a larger proportion (10 out of 16, 62.5 %) students agreed or strongly agreed that the e-portfolio helped motivate their learning. The undergraduate (UG) students had the lowest degree of agreement (53.13 logits). In the student free response comments, the term "motivation" was not present however other indicator words support that the use of the e-portfolio helps to motivate learning. The terms reflect/review, organize/construct were the most prevalent and common among all terms that routinely appeared within the free responses and may be indicative of motivation to learn. Learning appeared to a lesser but significant degree.

In the student open-ended responses to questions b, c, and d, which ask for what aspects of the e-portfolio were least beneficial or could be eliminated, 30 out of 46 student (65.2%) responses indicated that nothing was unbeneficial, the remaining responses focused on a variety of technical aspects (e.g., icons, video function, formatting, ease of use, and the time

required) and were unrelated to learning or course pedagogies. For the student open-ended responses to question d, which ask for any other comments, 28 out of 46 (60.1) responses indicated that there was nothing they wanted to add, the remaining responses focused on a variety of technical aspects (e.g., icons, video function, and formatting).

Discussions

The landscape of higher education has changed dynamically over the past two decades with dialogues focusing on evidence-based instruction, active learning, new pedagogies, the integration of technologies for learning, and increased accountability at all levels. Despite the myriad of educational publications that document the importance of student engagement, active learning, and learner-centered teaching approaches in higher education (Al-Zahrani, 2015; Angela et al., 2015; Freeman et al., 2014), a significant proportion of courses and classes still follow a traditional didactic information dissemination mode and fail to capitalize on the use of technologies developed to facilitate student learning and acquisition of essential twenty-first-century skills (Chu et al., 2021; Crogman et al., 2015) and is especially prevalent in many Asian universities. One reason is that often teachers who engage in teaching innovations that focus on active learning, student empowerment and the development of higher-order cognitive skills are penalized in student rating (SETs), which can adversely affect career advancement. In addition, despite the effort and scholarship involved in developing and implementing teaching innovations and new approaches, the efforts are often not recognized or rewarded which disincentives teachers to try new educational approaches despite the body of evidence which indicates that traditional didactic content-centric teaching approaches do not meet current and future student learning needs (Freeman et al., 2014).

Because of cultural and contextual differences, Asian and Western educational institutions embrace and implement change concerning how teachers teach and how students learn differently. Asia tends to lag behind in adapting to the education reforms implemented in the United States and other Western countries (Hallinger & Lu, 2011): "It is ingrained in the Asian psyche that correct answers always exist and are to be found in books or from authorities. Teachers, dispense truth, parents are always

right and political leaders know better" (Shaw, 1999, p. 23). This belief has made the change to learner-centered education more challenging (Hallinger & Lu, 2011). In this study, we looked at the effects of implementing e-portfolios as a tool to facilitate student engagement and learning for pre-service and in-service K–12 teachers in Macau. K–12 education in Macau, like that in much of Greater China and Asia, predominately follows century-old traditions wherein the teacher lectures, students sit passively and assimilate content information through rereading, reciting, homework, and rote memorization, which is then assessed through content-driven tests measuring lower cognitive skills levels (Author, 2019). This century-old cycle in part comes about because of cultural aspects and the fact that K–12 instructors teach as they were educated (Light et al., 2011) and are often unaware of the many educational resources available to reshape how they teach and how students learn in today's modern world.

The pedagogical purpose of integrating the online e-portfolio was to facilitate deeper learning and understanding of the three course components, namely (a) learning theories of how students learn, (b) pedagogies for learner-centered teaching, and (c) assessments of/for/as learning. Deep learning should be today's goal of learning in higher education (Kuh et al., 2005). From the course survey questionnaire and student reflections on the e-portfolios, we found the structure of the courses and the integrated use of the e-portfolios resulted in deeper learning, increased understanding, and helped students become comfortable with the use of technologies for learning. Deeper learning is facilitated when the course learning activities involve active learning such as self-ownership, recall, reflection, situated learning, peer interactions, and increased motivation (Light et al., 2011; National Academies of Sciences, Engineering, and Medicine, 2018). The general course structure embraced these attributes in a variety of ways with the e-portfolio serving as the connecting instrument by which students organized and documented their learning, shared course products, and reflected on their development as present and future K–12 teachers. The quantitative results showed that the strongest aspect of the e-portfolio was reflected in the weekly postings in what they documented and what they took away/learned from each class (Q1 in Fig. 4.3). Students documented what they learned from each lecture component, recorded learning artifacts and their experiences, and reflected upon what they learned and mistakes they made in the process of learning.

In the qualitative analysis of student open-ended responses, words such as document, record, review, reflect, organize, and construct were the most common terms (see Table 4.2). The e-portfolio was designed to facilitate active learning through feedback from peers and instructors. It allowed students to see and comment on each other's work and they were encouraged to do so. However, this aspect of the e-portfolio was not used by the PG students, that is, the number of peer comments for both PG-1a and PG-1b was less than five for each of the courses. The reasons for this are not known but may reflect the student age profiles of PG-1a and PG-1b, less familiarity with social media and/or reluctance to evaluate peer contributions.

Each of the course modules and learning outcomes was linked to one or more e-portfolio assignments which served to empower and encourage students to think out-side-the-box as they engage the course components, learning theories, assessment and learner-centered pedagogies from different perspectives. Documenting each assignment in the e-portfolio enabled students to creatively explore and carefully reflect on their current understanding by asking critical questions about how their knowledge was constructed, where it derived from, and what to learn next (Light, et al., 2011). They examined these leading questions and assignments and put them into practice (Cambridge, 2010) in innovative and creative ways, for example, see Fig. 4.2 where they designed a new report card showing learning outcomes using an innovative assessment method. Current K–12 student report cards document only one aspect of student learning for each subject often by a single letter grade. This limitation was addressed by them when they designed new report cards documenting students' learning progressions. The new report cards were designed to provide students and parents with information about where learning began, what the learning objective was, and how far toward that objective the student progressed. This provides evidence of how the use of the e-portfolio nurtured and supported the critical and creative thinking of students through the documentation of learning experiences and reflections on those experiences.

The documentation and reflection of the growth of one's knowledge over time highlight the affordances of e-portfolio as an assessment tool. In the courses, online e-portfolios were used to monitor their learning progression on a weekly basis and as a mechanism to evaluate student

obtainment of the intended learning outcomes. It also served as the mechanism by which student products were submitted (RQ3). Because all student e-portfolio products were shared with all class members, this provided external incentives for students to do their best so as to not be embarrassed in the eyes of their peers. The instructor's evaluation and grading of the products were confidential to the student and instructor. The use of shared multiple e-portfolio products allowed students to learn from their peers and build upon their own as well as peer creative skills providing a feedback mechanism for learning and improvement. Traditional assignments and assessments are often one-way, that is, once a grade is assigned, it ceases to be of learning value to the student, whereas with the e-portfolio, students can see their own learning progression as well as that of their peers. As such the e-portfolio allows assessment of, for, and as learning (Light et al., 2011).

For RQ4, one issue we wished to understand is whether the use of the online e-portfolio motivated student learning. Student responses in the survey show that students felt that the use of the e-portfolio helped motivate them to learn the course components. Interestingly, the term motivation did not appear in the student free responses. Motivation for learning is a complex issue and is affected by internal (student attitudes, mindset and perceptions) and external (course pedagogies, course demands and expectations) factors. Recent work by National Academies presented in How People Learn II delineates pedagogies that support and facilitate student motivation for learning (National Academies of Sciences, Engineering, and Medicine, 2018), these include helping students set learning goals, learning experiences that students value, providing a sense of control and autonomy, and facilitating students sense of competency by helping them recognize their learning progress. All these components are embedded in the course pedagogies. As such, indirect support for the e-portfolio supporting student motivation for learning is present in the student free response comments if we consider words such as reflect/review, organize/construct and learning which are commonly mentioned in the student free responses. In addition, the weekly postings that captured what students took away from the class meeting may have served to motivate students to engage in the materials, which can be seen as learning (e.g., [*E-portfolios*] *Help me to write down knowledge points and can better understand them with the help of other classmates' notes.*)

Implications and Conclusion

To break teacher and content-centric educational cycle, we assess whether the introduction of a learner-centered pedagogy and the use of online e-portfolios in courses for both postgraduate in-service teachers and undergraduate pre-service teachers could be used to facilitate new visions and models for K–12 education in Macau, increase awareness of the importance of innovations in pedagogy and assessment, and foster the use of technology to facilitate student learning. The hybrid pedagogy involved the use of focusing questions, peer exploration of these questions, instructor lectures that contextualized the student explorations and the use of technologies for question exploration, content and learning documentation, and peer feedback and self-reflection. We examine if online e-portfolios enhance learning documentation, self-learning, peer feedback, and student motivation (RQs) (Alexiou & Paraskeva, 2010; Baharom, 2009; Barbera, 2009; Chye et al., 2013; Ebil et al., 2020; Jenson & Treuer, 2014; Kwok, 2011; Mobarhan et al., 2014; Nicolaidou, 2013; Song, 2021; Syzdykova et al., 2021; Welsh, 2012; Yastibas & Yastibas, 2015).

To address the need for improvement of educational approaches in an Asian school system from didactic lectures to one that involves learner-centered pedagogies and technologies of enhancing learning, we modeled the use of learner-centered teaching and e-portfolios in three 14-week required courses for pre-service and in-service teachers. The courses focused on three main educational components: (a) learning theory, (b) assessment of and for learning, and (c) learner-centered pedagogies. The instructor modeled learner-centered pedagogies and the use of student e-portfolios to engage and capture student learning. A total of 67 teacher-students in three cohorts across two academic years participated in the study. They were required to do weekly e-portfolio entries which were shared with the class and monitored by the instructor. Student responses on an anonymous survey instrument on how the course's learner-centered pedagogy and use of e-portfolios enhanced student motivation,

engagement and facilitated learning. Students strongly support the integration of learner-centered pedagogies and the use of e-portfolios in motivating, engaging, and facilitating learning though there are slight differences between in-service postgraduate and pre-service undergraduate students with respect to these aspects. Change in educational systems is difficult, slow, and often recalcitrant; by focusing on grassroots players, for example, in-service and pre-service teachers, we endeavored to plant seeds of new awareness regarding how students best learn the value of new tools, for example, e-portfolios, and the impact of learner-centered empowered pedagogies and assessments that facilitate deep enduring knowledge and learning within local cultural contexts. We suggest other practitioners adopt the use of e-portfolios to foster deep learning by helping them to document their learning, engage in self-directed learning, receive feedback from their peers and increase motivation for learning and the use of online technologies through pedagogies that focus on students' active learning.

APPENDIX A

E-Portfolio Survey

This survey is anonymous and the options expressed in this survey will not affect your grade.

A. Gender:

☐ Male   ☐ Female   ☐ Others

B. I was familiar with e-portfolios before taking this course:

☐ Yes   ☐ Somewhat   ☐ No

C. I used e-portfolios before taking this course:

☐ Yes   ☐ No

Item	1 = Strongly Disagree	2 = Disagree	3 = Slightly Disagree	4 = Slightly Agree	5 = Agree	6 = Strongly Agree
1. The e-portfolio exercises help me to document my learning in this course						
2. The e-portfolio exercises help me to participate more actively in class.						
3. The e-portfolio exercises enable me to receive feedback on learning from my peers.						
4. The e-portfolio exercises motivate me in learning.						

a. Please explain how the e-Portfolio exercises help you to organize your knowledge and learning in this course.

b. What aspects of the e-Portfolio were most beneficial, explain?

c. What aspects of the e-Portfolio were least beneficial or could be eliminated, explain?

d) Is there anything else you would like to add with respect to your experiences with the e-Portfolio or this class?

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Innovation in Student Engagement

Project-Based Approach to Enhance Online Learning: A Case of Teaching Systems Thinking and System Dynamics Modeling

Sreenivasulu Bellam

INTRODUCTION: PROJECT-BASED INSTRUCTION ONLINE AND TPACK

Learner-centered teaching is found to be effective in higher education to achieve increased level of students' participation, peer-to-peer interactions, and active engagement with the content and to prompt positive inclination and responsibility towards learning (Baeten et al., 2013; Butt, 2014; Hannafin & Hannafin, 2010; Jones, 2007; Pedersen & Liu, 2003, Weimer, 2002; Wright, 2011). It places much of the responsibility of learning on the students—they must engage with the topic and solve problems, rather than simply listen to the instructor (Prince, 2004). Thus, compared to teacher-centered learning, learner-centered pedagogies enable students to be keenly involved in two fundamental aspects of the

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learning process—doing things to learn and thinking about the things they are doing which can lead to a broader and richer construction of knowledge (Weimer, 2002). To achieve this, pedagogical strategies such as collaborative learning through project-based learning in small groups offers promising scope to facilitate effective student participation and active learning (Kim & Hannafin, 2011; Weimer, 2002). While conducting online lessons instructors are required to develop strategies that enhance student engagement, active learning and build a sense of community that fosters an effective collaborative learning and independent learning (Garrison and Anderson, 2003; Kanuka and Garrison, 2004; Melrose and Bergeron, 2007; Munich, 2014).

As a learner-centric approach, project-based teaching involves instructors taking up their active role as facilitators to guide students to learn through an extended inquiry process and collaborative learning so that students are enabled to develop product, test a prototype/model, and reflect on the entire experience (Blumenfeld et al., 1991). Several studies documented various positive learning aspects and benefits of project-based learning (e.g., Hall et al., 2012; Krauss & Boss, 2013; Palmer & Hall, 2011; Starobin et al., 2014; Zhang et al., 2009) while emphasizing that students develop and hone various technical and life-long learning skills as they collaborate with peers while working on a project assigned to achieve the intended learning outcomes.

While engaging students online through projects/problem-based pedagogies, an enriching teaching and learning experience results when there is an effective overlap between major elements and subset of other associated elements related to pedagogy, content, and technology (Mishra & Koehler, 2006). For instance, teacher's role involves teaching presence that includes creating capturing learning environment for engaging students through teaching strategies (pedagogical content knowledge, PCK), delivery of the content (technological content knowledge, TCK) and designing learning activities for online platform (technological pedagogical knowledge TPK) to achieve intended learning outcomes. Students' role depends on their social presence for their active engagement, peer interactions among students and interactions with the teacher based on PCK and TPK elements. Thus, practically, TPACK emphasizes the interactions, connections, applicability, and limitations between and among the three components—content, pedagogy, and technology instead of looking at them in isolation. Accordingly, TPACK framework (Koehler & Mishra, 2009; Mishra & Koehler, 2006) can be defined as an integrated framework of content, pedagogy, and technology in their combined forms

as pedagogical content knowledge (PCK), technological content knowledge (TCK), and technological pedagogical knowledge (TPK) within teaching. In terms of teaching and learning of systems thinking and system dynamics modeling, TPK involves, besides regular ICT tools, teaching about using computer software programs such as Vensim (Ventana Systems Inc., 1990), Stella, and so on to enable students to learn simulation techniques. Role of the content and pedagogy such as project-based collaborative learning to deliver the lesson is to facilitate cognitive presence for engaging students to learn to think and think to learn while engaging them with the content (PCK). Both TCK and TPK guide in designing learning activities to facilitate learning of systems thinking and dynamic modeling online for students to achieve intended learning outcomes. This framework as shown in Fig. 5.1 also aligns well with learner-centered
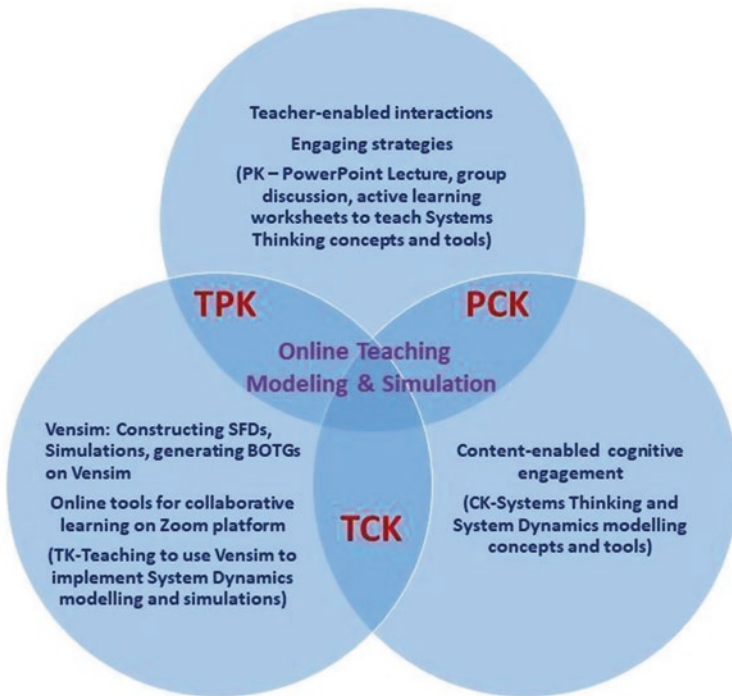

Fig. 5.1 Interdependent nature of the role of teacher, technology, and content for effective online teaching and learning of system dynamics modeling and simulation

teaching and constructs (Blumberg, 2019) such as *the role of instructor* (through teacher presence), *function of the content* (through cognitive presence), and *supporting student responsibility for learning* (through social presence). It is important to explore how instructors in higher education can be more effective in online/hybrid classrooms as the teaching approaches or methods matter significantly and differently in online or remote education than in traditional physical face-to-face teaching.

This chapter presents the implementation of a project-based approach for teaching systems thinking and modeling while engaging students via Zoom as an online platform, and the scope of integrating the TPACK framework.

Project-Based Pedagogy to Teach Systems Thinking Online

Collaborating with students through small group projects, discussions, and promoting peer-to-peer interactions is an important aspect of an engaging online teaching and learning environment and dynamics. However, the challenge is to implement the best strategy in online teaching that prepares, motivates, and engages all students (including the instructor also as a learning partner). One way to achieve this is by designing open-ended problems or projects that focus on real-world issues so that educators have the opportunity to motivate and engage students online and in realistic projects. In this context, systems thinking and system dynamics curriculum offers excellent opportunities for designing projects/problems that engage students online for deeper and holistic learning about relevant global problems (George, 2018). Systems approach to problem solving also provides students opportunities for active collaboration and empowers them to address future problems and hence several studies (e.g., Gregory & Miller, 2014; Pavlov et al., 2014; Richmond, 1991, Wheat, 2007, 2008; Yoon et al., 2017) have also emphasized the importance and benefits of advancing teaching systems thinking curriculum through formal education in both K-12 and higher education. For engaging students online, there have been different types of online teaching and learning activities, and tools related to systems thinking and system dynamics instruction (Zimmermann et al., 2021). Some include widely used interactive simulation environments such as C-ROADS and En-ROADS models (e.g., Rooney-Varga et al., 2020) as well as workshops (e.g., Eker et al., 2018). Except for a few online system dynamics

training and programs (Pavlov et al., 2014) along with online peer-mentoring groups (Richardson et al., 2015; Suprun et al., 2021; Wilkerson et al., 2020), there is still little published on online classroom teaching and learning platforms and strategies in engaging students for teaching systems thinking and modeling.

Project-based pedagogy is very much suitable to teach systems thinking and dynamic modeling as it allows instructors to design projects based on global challenges and real-world problems to engage students in multidisciplinary settings. Learning from such projects will also enable students to use the knowledge gained to solve real-world complex problems of the twenty-first century. But in order to accomplish intended learning outcomes in the online class, educators need to be organized and structured in delivering lessons and online engagement. Otherwise, it is very likely that students will perceive their online learning to be disengaging compared to their experience with traditional classroom learning.

Effective online teaching and learning involves a community of inquiry which is a theoretical framework where teachers and students create purposeful learning experiences collaboratively through critical discussion and reflections (Weimer, 2002). It is necessary to further explore the practicalities of delivering lessons online via Zoom as a platform and make recommendations for effective learner-centric approaches for online teaching and learning of systems thinking. As a web-based collaborative video conferencing tool, Zoom provides quality audio, video, whiteboard options, and screen-sharing and chat tools useful for teaching and engaging students online effectively (Brennan, 2020). At the same time, 'function of the content' (content and learning outcomes of systems thinking and system dynamics modeling projects/problems) and 'role of teacher' (online teaching strategies based on PCK, TPK, and TCK) to facilitate students' learning through interactive online tools such as Zoom both needs to be considered significantly as the learner-centered teaching constructs when facilitating project-based learning online.

Along these lines, this chapter discusses how project-based teaching can be facilitated as learner-centric pedagogy for teaching systems thinking and modeling online while engaging students via Zoom as an online platform. It is also to present the workable scope of integrating TPACK framework for creating a positive and effective learning environment on Zoom for implementing project-based teaching and learning online as technology-enabled instruction.

What Students Need to Learn? Conceptual Tools and Methodology of Systems Thinking and System Dynamics Modeling

The field of systems thinking and dynamic modeling was developed by Jay Forrester (Forrester, 1961, 1971, 1994) and many people have contributed to its development (e.g., Richardson & Pugh, 1981; Richmond, 1994, 2000; Senge, 2006; Sterman, 2000 and many others). Systems thinking approach has been regarded as a promising venue to address complex problems (Stroh, 2015), dealing with the twenty-first-century challenges (Binkley et al., 2012), developing leadership skills (Palaima & Skaržauskienė, 2010), and public policy making through policy debates (Meadows, 2008; Senge, 2006; Sterman, 2000).

Systems thinking is a higher-order cognitive skill that involves a methodology for identifying parts/elements/components, quantifying, and formulating a system for simulations to understand the emergent dynamic behaviors of a system arising from interdependent interactions among various components. It is a visual language (metaphorically it is also known as 'ice-berg thinking, i.e., understanding a problem at a surface level from its behavior pattern to a deeper level of understanding the system structure causing such behavior) that requires a variety of conceptual tools such as plotting dynamic behavior patterns (behavior over-time graphs, BOTGs), causal loops diagrams (CLDs) with reinforcing (R) and balancing (B) feedback loops, stock and flow diagrams (SFDs), and system archetypes (Anderson & Johnson, 1997; Arnold & Wade, 2017; Meadows, 2008). Some of these conceptual tools are shown in Fig. 5.2 and for more details and understanding, readers are recommended to read a primer on systems thinking by Donella Meadows (Meadows, 2008).

These collections of tools, in particular, constructing models in the form of CLDs and SFDs, and simulating them on a computer software to observe and interpret the behavior over time graphs (BOTGs) are essential. Accordingly, teaching strategies involve introduction of these conceptual tools and system dynamics methodology (e.g., see Fig. 5.3), and students are expected to learn all these collections of concepts and tools while the content, pedagogy, and problem assignment should align with the intended learning outcomes. Teaching practice described in the following section will provide an example of how a project-based teaching and learning can be implemented while enabling students to apply the knowledge of CLDs and SFDs for modeling and simulating the given
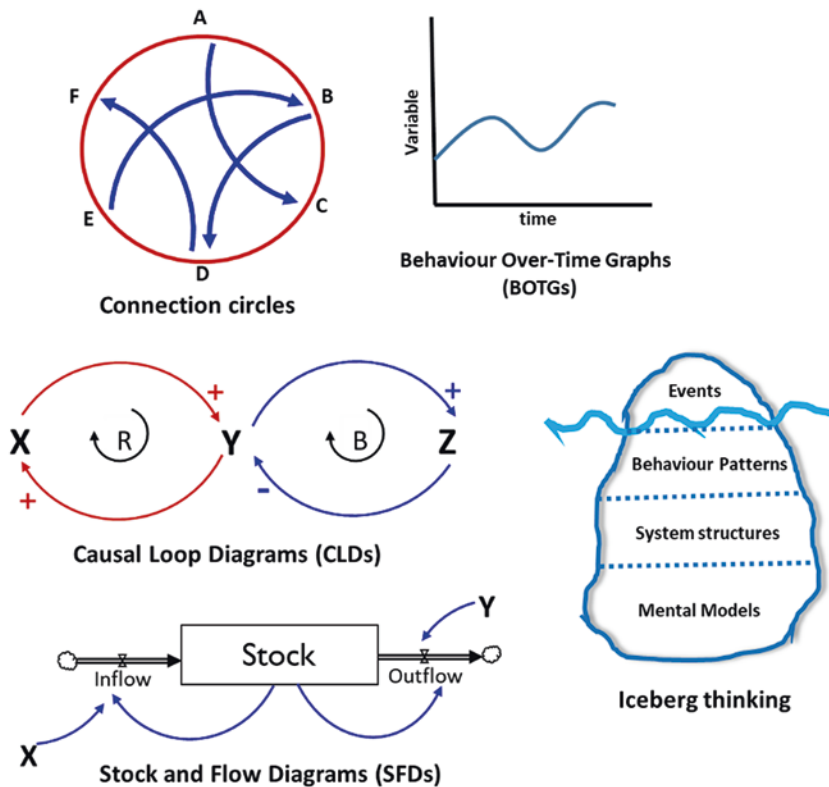
Fig. 5.2 Important conceptual tools in systems thinking and system dynamics modeling

problem (please see sample group project discussed under teaching practice section).

Systems thinking and system dynamics methodology as depicted in Fig. 5.3 refers to a set of conceptual and analytical methods used for approaching problems through both qualitative and quantitative modeling aspects and simulations (Richardson & Pugh, 1981).

As part of this methodology, it is essential to teach about computer programs such as Vensim, STELLA for constructing (CLDs), formulating stock and flow diagrams (SFDs)/models to simulate and visualize dynamic behaviors (BOTGs) arising from interdependent interactions among
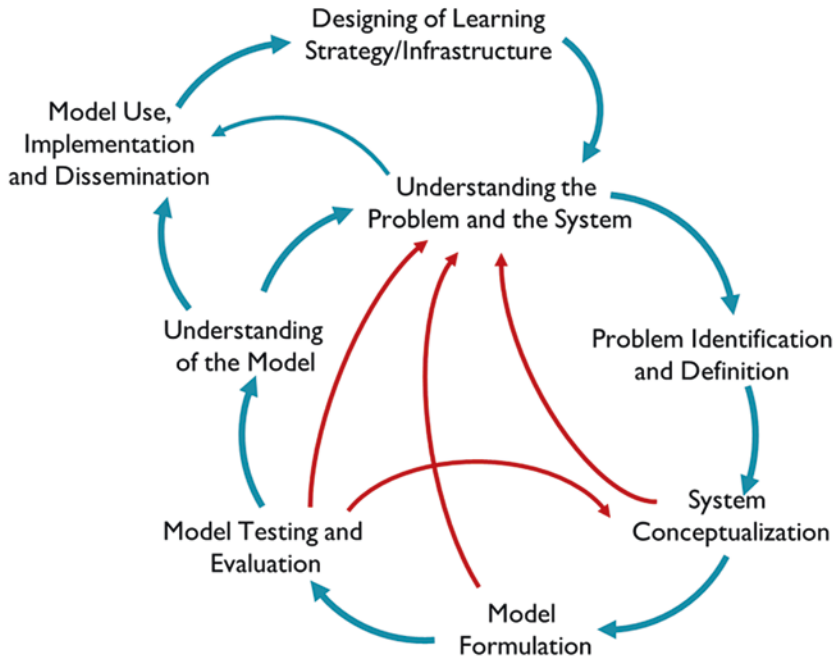
Fig. 5.3 Steps in systems thinking and system dynamics methodology (Richardson & Pugh, 1981)

various components of a system or complex problem under study. Hence, in any course based on systems thinking and system dynamics modeling curriculum, major learning outcomes, based on projects and case studies, will be intended to enable students to understand complex real-world issues/challenges holistically through building qualitative and quantitative computer models and simulations, to perform policy analysis to suggest possible holistic solutions and to acquire twenty-first-century skills (Meadows, 2008; Senge, 2006). Teaching through modeling projects will also enable students to visualize non-linear interdependent interconnections and interactions among various sub-systems of complex and dynamic systems, together with an understanding of how the system changes over time (interpretation of BOTGs obtained as simulation graphs).

Along these lines, a sample project assignment and teaching practice described below provides an example of system dynamics modeling

activity about how an energy system is interdependent on other systems/problems holistically within a boundary, and how it can be taught/facilitated online via Zoom through a combination of online PowerPoint lecture, scaffolding online YouTube videos, interactive conversations for learning modeling and simulation, discussions in small groups in breakout rooms.

Teaching Practice: Project-Based Learning and Engaging Students Online

Promising strategies to teach students about systems thinking and system dynamics modeling activities include a combination of project- and problem-based approaches and case studies based on real-world problems (George, 2018). Here, it is mainly intended to enhance students' higher-order thinking and reasoning skills while facilitating their learning through online lectures, discussions, modeling software for simulation techniques, relevant videos about the topic on Zoom. For teaching at Residential College 4 in NUS, Singapore, I have designed and developed junior and senior seminar modules on energy systems based on systems thinking and system dynamics curriculum. During the past semesters, due to Covid-19 situation, these courses were delivered online via Zoom. A sample project-based teaching and learning assignment described below offers an example of how learning from systems thinking projects can be facilitated and implemented online by engaging students via Zoom as an online platform. It is also intended to share teaching strategies implemented through a workable framework of TPACK by bringing together the systems thinking content, pedagogy, and technology into online classroom instruction via Zoom as a platform.

Project Assignment (Sample Small Group Project)

Problem assigned for modeling: How would oil-based energy system impact resources, GDP, environment, and population? Consider different variables/factors related to these sub-systems for modeling—undiscovered oil resources, discovery, extraction, available barrels of oil, burning of oil, energy production per barrel of oil, actual energy reserves, energy consumption, investments per year, R&D for energy industry, smart materials for energy industry, GDP, GDP per capita, standard of living, birth rate, population,

death rate, CO_2 emissions, CO_2 in atmosphere, environmental pollution, chemical breakdown of CO_2.

This small group project requires students to model the interdependent interactions of energy system (fossil fuels system such as oil resources) with other sub-systems—population, economy, energy production, emissions, and environmental pollution. For students to complete this small group project, teaching requires two contact sessions (2.5 h each per week) over two-weeks during a 13-week semester. Besides, they are also expected to spend time out of the class, to continue it as homework after the first contact session, as part of learning outside the classroom and also to fulfil weekly workload per course. The underlined text/points in each task 1–7 below align with the steps involved in system dynamics methodology shown in Fig. 5.3 (students need to apply systems thinking concepts and modeling methodology to develop models in the form of CLDs and SFDs and simulate them to obtain and interpret the behavior graphs [BOTGs] obtained to propose policies/solutions).

1. *Map the interdependent cause and effect relationships* among the above given variables.
2. *Construct qualitative model as an overall causal loop diagram (CLD)* with appropriate reinforcing and balancing feedback loops.
3. *Propose dynamic hypothesis* as behavior over time of the interdependent systems: oil resources, energy production, CO_2 in atmosphere, GDP, population.
4. *Develop a quantitative model, stock and flow diagram (SFD)* based on the causal loop diagram or model constructed in task 2 above.
5. *Use the given real-world data* for all the variables/quantities in the stock and flow diagram and *formulate and simulate the stock and flow diagram in Vensim* software program and *discuss useful insights from this model behavior.*
6. *Perform sensitivity analysis* and *propose policies* for sustainable oil usage for electricity production.
7. *Present your group's model (communication)* to the class and discuss the simulation results and policies developed.

Implementation of Project-Based Modeling Activities Online Via Zoom and TPACK Framework
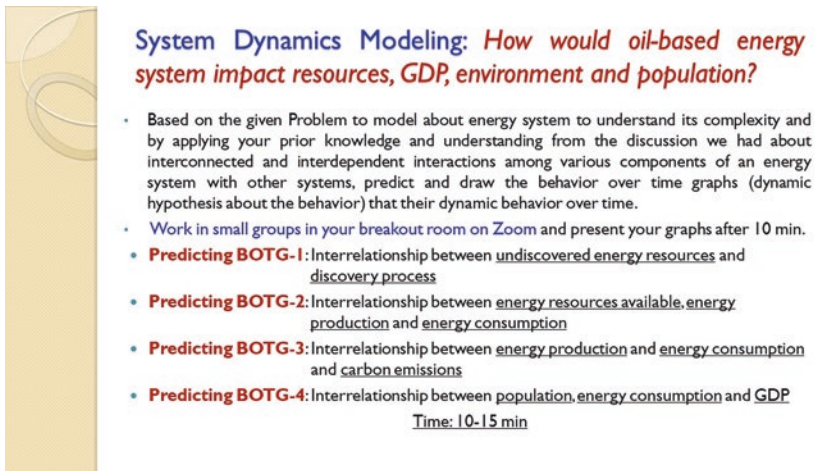
The above methodological steps (also the learning outcomes) 1–7 are intended to teach/facilitate students to apply systems thinking concepts and modeling tools to model complex interdependent interactions of an 'energy system' with other economic, political, social, technological, environmental sub-systems/factors. Accordingly, various teaching strategies online through a combination of PowerPoint lecture, scaffolding online videos, and small group discussions via Zoom and various tools focused on discussing fundamental topics and various conceptual tools associated with systems thinking and modeling to understand the complex real-world issues associated with various renewable and non-renewable energy systems. For teaching, students are engaged in small groups in a seminar-style format by discussing the given project assignment to model 'interdependent interactions of an energy system with other systems'. Students are also allowed to discuss and revise the concepts and apply modeling methodology—starting from developing qualitative (CLDs) and quantitative (SFDs) models to performing simulations on Vensim (a simulation software program) and interpreting dynamic non-linear behavior patterns of various sub-systems associated with an energy system, and to propose policies or solutions.

Teaching strategies implemented: Online teaching provides a good scope to integrate PCK and CK with TPK for technology-enabled teaching (here Zoom as an online engaging platform) to engage students to learn actively. Teaching how to model the above problem requires students to use Vensim for constructing models (causal loop diagrams, CLDs, SFDs), simulating techniques on Vensim for generating and analyzing dynamic behavior patterns (BOTGs) (e.g., see Figs. 5.6, 5.7, 5.8 and 5.9). Accordingly, teaching involves bringing together the 'content' (integrating conceptual tools following the modeling methodology by using PowerPoint slides), guiding students on how to draw CLDs on whiteboard on Zoom, conducting a demonstration about simulation techniques and analysis tools on Vensim and 'technology' (PowerPoint lectures, videos on energy system, and simulation techniques in Vensim), and hence offer workable integration of PCK, TPK, and TCK aspects into online teaching of systems thinking and modeling (see Fig. 5.1). Teaching systems thinking and dynamic modeling itself also requires demonstrating how to develop and visualize models on a computer simulation software,

Vensim. Thus, systems thinking and system dynamics content and pedagogy integrate technology inherently and hence offers additional scope to integrate TPK and TCK, besides PCK, for conducting lessons whether in hybrid mode or fully online. Various teaching activities implemented to engage students online via Zoom are described below:

Introducing the topic and problem given for modeling through PowerPoint lesson via screen-sharing tool: During the first 10 min, lesson slides about how an energy system interacts with factors or sub-systems, modeling tasks and learning outcomes are explained and discussed through slideshow on Zoom *via* screen-sharing option. This PowerPoint lecture (see screenshot in Fig. 5.4) helps to grab student's interest and attention compared to just talking about the content without such visuals. This brief lecture is intended to enable students to recall the topic, modeling tools, and induce motivation to actively participate. Thus, discussing the modeling problem about energy system and concepts through PowerPoint slides online engaging students via screen-sharing tool on Zoom constitutes PCK and TPK. With this, students are expected to draw the BOTGs as part of modeling.

Activity to scaffold modeling tasks through online YouTube videos (screen-sharing tool): After the above 10 min discussion, students are allowed to

Fig. 5.4 Screenshot showing the content discussed through PowerPoint slides
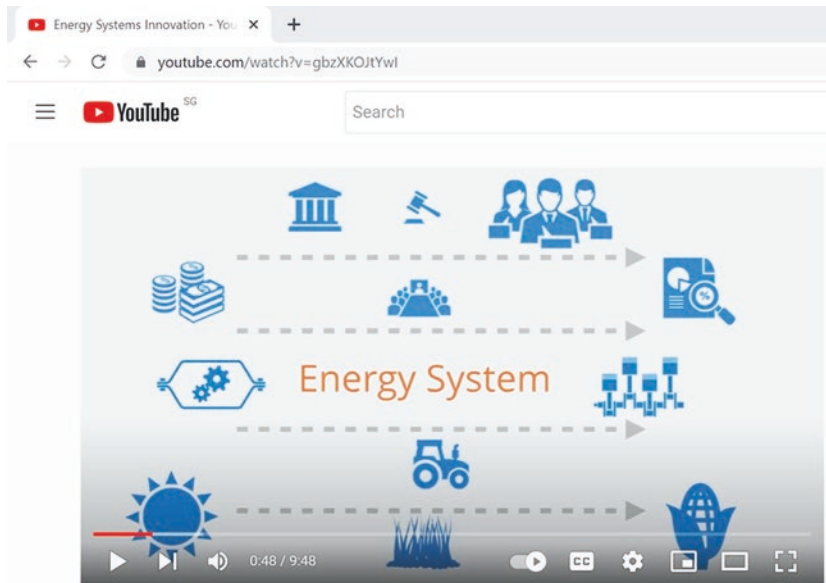
Fig. 5.5 Screenshot of YouTube video used to scaffold teaching and learning

watch a short 5 min online video (see screenshot in Fig. 5.5), displayed through screen-sharing tool on Zoom which is about complex interdependent factors in an energy system. This teaching activity is intended to further scaffold students' understanding and ability to model complex interdependent relationships of an energy system with social, environmental, and economic sub-systems. After this activity, students are allowed to ask questions using 'chat' tool on Zoom. This part of teaching constitutes TPK (online video-enabled pedagogy to deliver the content via Zoom relevant to the modeling an energy system project) along with PCK (knowledge about video-based teaching) and TCK (content relevant to problem given and modeling of energy system delivered as a video narration).

Facilitating interactive Q&A about the project and modeling activity (Chat tool on Zoom): After the above short PowerPoint lecture and video-based learning activities, feedback/answers are provided to students' questions populated in the chat box. They are also encouraged to ask questions on Zoom chat related to the modeling tasks in the project. This
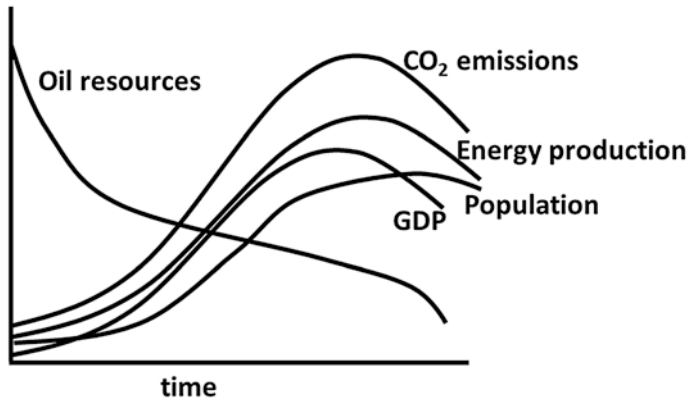
Fig. 5.6 Sample of students' answers predicting the model dynamic behavior patterns of oil resources, energy production, emissions, GDP, and population

constitutes TPK (engaging students to discuss questions online via Chat tool on Zoom).

Discussing the outcome of the above two teaching activities (whiteboard tool on Zoom): At this stage, students are expected to actively draw BOTGs. Similar to inviting members of a small group to volunteer up to the whiteboard in a face-to-face classroom, a student from each group is allowed to share their answers (BOTGs) using screen-sharing option and then whiteboard tool on Zoom for drawing the graphs. Students were able to use a whiteboard tool to draw graphs similar to Fig. 5.6 to show the predicted dynamic behavior (dynamic hypothesis) of various sub-systems in the model. At this point, it is important to be patient, motivating, and supporting students so that they can take the opportunity to come forward to share their ideas using the whiteboard tool on Zoom. Each group is given 5–10 min for this activity. This teaching activity of engaging students on Zoom to actively participate by presenting their answers constitutes PCK (enabling students to participate actively to discuss what they had learnt through drawings and knowledge gained) and TPK (knowledge of enabling students to utilize the online whiteboard tool).

Teaching and collaborative learning in small groups (Breakout Rooms on Zoom): Breakout rooms in Zoom are very useful for facilitating group work, peer interactions, and group discussions among students as they are allowed to join breakout rooms and work collaboratively in small groups to complete project's modeling tasks. Once they start working in small

groups, as part of teaching and guiding, I move between breakout rooms to monitor their activity and to answer their questions as they develop models—CLDs and then SFDs on Vensim program. One of the group members is also assigned as a volunteer, for example, to lead the breakout discussions, to take notes to be discussed and so on. This is to make sure to keep students not only engaged in the group and in the modeling activity but also helps me to monitor their learning in a more engaging manner online. This teaching and learning activity facilitating small group discussion and monitoring students' progress involves TPK (pedagogical knowledge of engaging students online via Zoom breakout rooms). This task takes about 30–40 min. After completing the tasks in small groups in breakout rooms, each small group is expected to have completed modeling the causal loop diagram (tasks 1 and 2 of the project) along with identification of feedback loops. Aligning with the intended learning outcomes, almost all the small groups have developed their qualitative model (causal loop diagram) on the Vensim program. Each student in the group is allowed to share the Zoom screen to discuss the model and feedback loops they have developed. Students developed their model CLD on Vensim and discussed it by sharing it on Zoom screen together with the MS Paint tool to edit it. Sample of the model CLD shared on Zoom screen by one of the small groups is shown in Fig. 5.7 (students' faces are blurred in
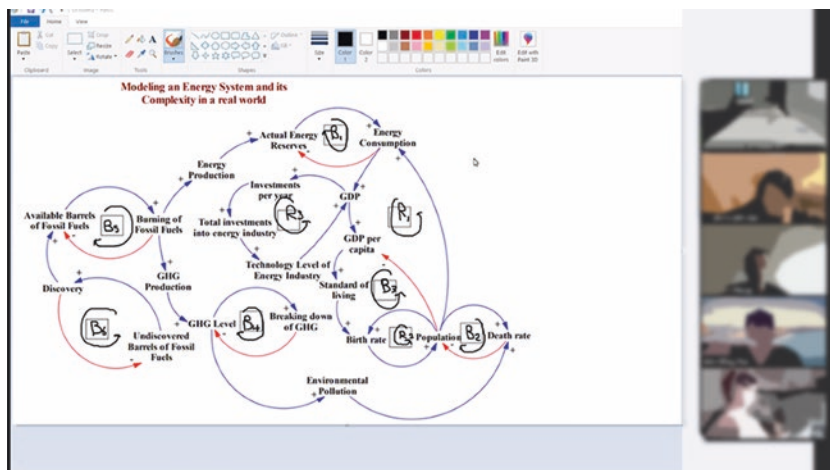
Fig. 5.7 Screenshot of the model CLD developed by students while teaching and interacting in Zoom breakout rooms

order not to reveal their identity). This teaching and monitoring activity while interacting with students working in breakout rooms demonstrates that students were facilitated to apply systems thinking concepts to model how energy system interact with population, resources, economy, and technology sub-systems (Fig. 5.7). This part of the activity aligns with the TPK to enable students to present their models, and TCK (enabling students to use Vensim software to discuss the model and content about feedback loops).

Thus, by the end of the teaching session 1 different activities have been implemented online as discussed above, and for completing the tasks 1–3, students are able to develop a model as CLD and also predicted the dynamic behavior patterns of oil resources, energy production, CO_2 in atmosphere, GDP, population over time and discussed it on Zoom. By developing deeper understanding of a problem in a bigger picture based on this model, they are allowed to continue to work on the remaining tasks 4–7 before attending the contact session 2.

Teaching and guiding students online (breakout rooms) to complete the model, discuss, and reflect: During this session, tasks completed in contact session 1 are reviewed and then students are expected to focus on the remaining tasks 4–7 to complete the project for developing the quantitative stock and flow model and simulating it on Vensim.

For this, students are directly put into breakout rooms on Zoom to continue to work in groups to construct the stock and flow model (SFD), complete the formulation and simulation on Vensim based on the data given. As part of teaching and interactions with small groups, I join breakout rooms randomly one by one to monitor and enable them to get their final model and simulations completed, and have the output graphs and results ready for sharing and discussion. During this session in breakout rooms, all groups are able to complete the given tasks 4–7 as assigned in modeling problem/project. When they are ready, breakout rooms are closed and allowed to share their model, simulation graphs, policies developed, and so on to the class by screen sharing on Zoom, followed by questions and answers, my feedback, and reflections about their learning. Sample stock and flow diagram/model and simulation graphs developed on Vensim by students based on the modeling steps 4–7 and the intended learning are shown in Figs. 5.8 and 5.9. Prompting them to interpret the simulation graphs generated as in Fig. 5.9 also facilitated active discussions among students in groups to understand the system behaviors quantitatively and holistically by relating their reasoning to causal loop diagrams
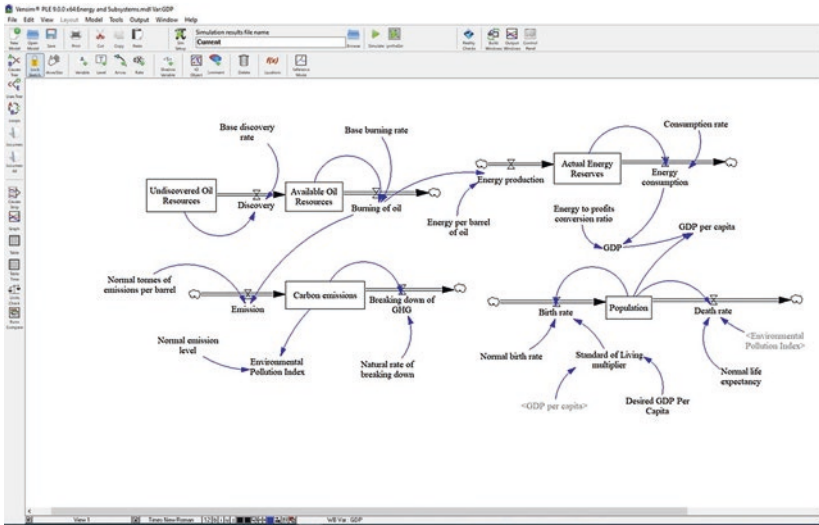
Fig. 5.8 Screenshot of the sample SFD model developed by students on Vensim while working in breakout rooms
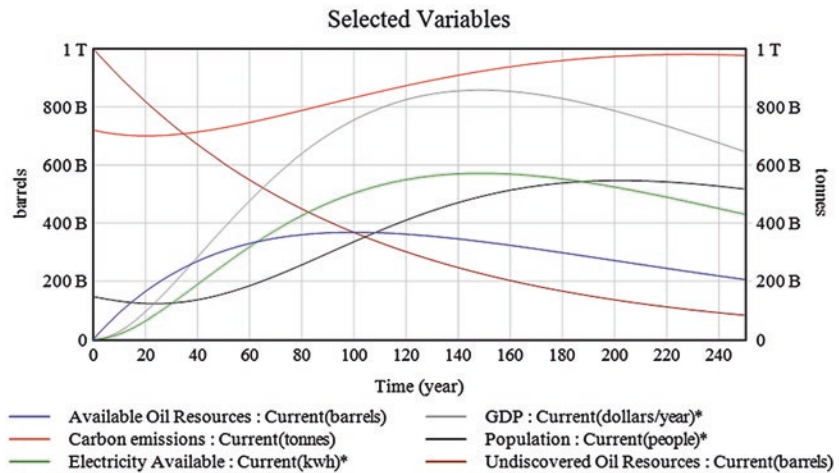
Fig. 5.9 Screenshot of the simulation graphs showing model behavior by simulating the stock and flow diagram in Vensim done by students in breakout rooms

and stock and flow diagrams. Through this whole teaching activity, students are enabled to model, simulate, and discuss results to propose solutions to the problem.

Thus, the above project-based teaching and learning activities implemented to engage students online via Zoom platform are based on the framework of creating active learning community and, broadly, it can be achieved by the integration of various interdependent elements of online instruction and TPACK. The case of teaching practice discussed here represents importance of the role of the 'function of the content'—systems thinking and system dynamics curriculum and simulation programs such as Vensim for modeling complex problems, and teachers' ability to integrate the components of TPACK and facilitate learner-centered online teaching on any platform such as Zoom, Google Classroom, MS Teams, and so on.

Based on students' reflections in terms of teaching and learning through various activities implemented online on Zoom, the overall impression was that the small group project for an interactive modeling activity and computer simulations enabled them to achieve the intended learning outcomes, learning environment was positive, interactive, and engaging. Some of the students' comments/perspectives about their learning based on their reflections are given below:

> It was a good learning experience as my group and I attempted to apply the things we learn into context. By applying the relevant concept and skills, I was able to better model behavior of effects and changes using CLD, SFD, sensitivity analysis, etc. This really enhanced my learning experience.

> It was an interesting and enriching experience working together with other students from different faculties and majors. Especially with the current zoning measures on campus, I have not really gotten a chance to interact with students from other zones, though I was able to talk to some of these students through this module, albeit through texting or Zoom only. As part of a small group, we had to interact with one another quite a lot, and help each other understand certain things that we each were unsure of. We figured out a way to collaborate on our projects in an efficient and effective way as well, although online as we could not meet one another in real life due to Covid.

> I have learned the dynamic behaviors of a system and how we can predict the dynamic behaviors based on system's interdependencies, for example,

reinforcing loop can cause vicious cycle, balancing loop can cause oscillation, and so much more. I am able to model real-life problems and using tools such as Causal loop diagram, and stock and flow diagram to see what pattern the behavior generates over time. Sensitivity analysis is also performed to see how certain variables/stocks are affected if we were to change a certain variable. This allows us to propose policies to prevent undesirable outcomes.

A comment taken from end-semester student feedback report—*"Prof. Bellam is a very enthusiastic lecturer who delivers content in a detailed manner. He would carefully explain the concepts and ensures that everyone in class is following. Moreover, he strives to create an inclusive environment where everyone's thoughts and comments are valued. This makes me felt very supported during my learning"* indicates how students perceived my instructional strategy.

Figures 5.7, 5.8, and 5.9 can also corroborate evidence of students learning from this lesson implemented online. Interactive sessions enabling them to learn to use modeling and simulation software (Vensim) while having them on Zoom was found to be very engaging. Besides interacting with me, students have also indicated that they were able to interact with peers effectively in breakout rooms to develop the models as in Figs. 5.7 and 5.8 and interpret simulation behaviors (Fig. 5.9).

It can be concluded that a teacher needs to act as a facilitator while integrating various teaching tools online—PowerPoint, YouTube videos, interacting with students in breakout rooms, employing Zoom tools to engage students to present their work, and guiding students throughout an inquiry process collaboratively to develop a model, simulation results, and reflecting on the entire experience.

Challenges and Recommendations

It is essential to explore how instructors in higher education can be more effective in online/hybrid classrooms as the teaching approaches or methods matter significantly and differently in online or remote education than in traditional physical face-to-face teaching (Garrison & Anderson, 2003, Garrison & Vaughan, 2008). For any online lesson it is also important to integrate the TPACK framework to establish technology-enabled instruction for social, cognitive, and emotional presence to build a successful learning community for effective student engagement. In the absence of

social, cognitive, and emotional presences, it is possible that students will perceive their online learning to be less engaging and effective compared to their experience with a face-to-face course in a classroom. In order to overcome this perception, different features of Zoom had been utilized adequately to create interactive online learning environments. In fact, the Zoom platform can also be used for project meetings with students, online lectures, consultation sessions (office hours), video-based learning, and organizing webinars.

For designing open-ended problems/projects which focus on global issues, instructors need to take opportunities to focus on learner-centered pedagogical strategies to be implemented online to engage students in realistic workable projects that will allow students to encounter and resolve conflicts, provides opportunities for collaboration, and empowers them to address future problems. Collaborating with students in discussions and encouraging peer-to-peer interactions is an important feature to the dynamics of an engaged online lesson. However, the challenge is to incorporate these best pedagogy and practice principles in online instruction that prepare and engage all students (including the instructor also as a learning partner). Hence, for students to accomplish course objectives and outcomes, instructors need to be organized and structured in their online content development, and they need to provide clear and well-defined projects or problems for active engagement and participation. It can also be recommended that instructors can test run each online activity before any actual online teaching session to ensure that all the features of Zoom or any other such platform are enabled prior to the teaching activity.

While online teaching and classes are not without challenges, there can, in fact, be some concrete steps to run and make online lessons energetic, interactive, and productive. In general, whether teaching is blended or hybrid mode, some of the suggestions can be:

- Set ground rules and inform students what to expect from their participation.
- Ask participants to keep their cameras on.
- Carry out a quick social check-in at the beginning of class.
- Make content and learning activity well synchronized, learner-centric, connected, and relevant.
- Start active communication, students can be asked to come with one burning question about the topic at hand.

- Make sure the synchronous lesson offers novel content, insights, or activities.
- Pose a question and give participants a moment to write and share it using online tools such as chat room or whiteboard.
- Ask questions that require students to pick a side.
- Use synchronous sessions as consultations to supplement lessons covered earlier.

Conclusion

Teaching practices described here exemplify that learning through projects is a promising learner-centered and inquiry-based instruction even when engaging students in an online teaching and learning environment. It also shows that it is possible to integrate the CK, PCK, TCK, and TPK together throughout the instruction on Zoom platform to foster active and collaborative learning online by utilizing various Zoom tools—screen sharing to teach/discuss content using PowerPoint, using a virtual whiteboard with annotation capacity to explain concepts, chat to questioning and discussions, breakout rooms to facilitate collaborative peer interactions in small groups, polls for students' feedback, and so on. Further, the function of the content and role of instructor both are important to be considered as learner-centered teaching constructs to facilitate active teaching and learning in an online environment.

Teaching and learning online can be exasperating both for the students and the instructor, particularly for those undertaking it for the first time. Whether independent or collaborative learning, students accustomed to traditional classroom procedures—taking notes during a lecture, asking and answering the occasional questions, participating in discussion, interacting with peers—need to make unexpected and often jolting adjustments to their learning and classroom habits which make it hard to accept. It is equally challenging for the instructor to deliver the content as effectively similar to teaching in a traditional face-to-face lesson. Because missing traditional teaching practices/conventions that used to convey true intentions, gestures/body language, and vocal intonations while teaching online platforms sometimes might leave students in real distress. Hence, it is also equally important to consider learner-centric approaches in combination with possible TPACK framework to design pedagogical strategies for successful implementation of teaching and learning with technology whether instruction is online, face-to-face, or blended/hybrid model.

Aligning with the suggestions offered in the previous section for engaging students online effectively and interactively, a case of teaching and discussion presented in the above sections is also intended to offer positive reflections, useful perspectives on teaching system dynamics modeling tools and implications for online learning. Obviously, it can also be learnt that project-based pedagogies for teaching systems thinking and system dynamics modeling allow educators to design interdisciplinary real-world problems based on global challenges and to engage students effectively in online learning.

In conclusion, whether teaching online/hybrid lessons or even face-to-face sessions, learner-centered approaches equally emphasize promoting active learning through effective student engagement and positive learning environment similar to that of traditional face-to-face settings. Hence to conduct engaging online lessons, instructors are required to develop strategies that enhance student participation, active learning, and build a sense of community that fosters an effective collaborative learning in groups. Active learning needs to go hand-in-hand with pedagogies and technologies to achieve the intended learning objectives from the project/content. In this context, systems thinking and system dynamics curriculum and courses offer excellent opportunities for engaging students in deeper and holistic learning about relevant global problems through project-based teaching and learning. Accordingly, this chapter and the description of teaching practice implemented online, integrating TPACK, for teaching systems thinking and system dynamics modeling on Vensim program, and models and simulations students have developed while learning online via Zoom to model the given problem suggest useful insights about project-based teaching and online teaching approaches that help students solidify many of the underlying tools and concepts of systems thinking and modeling.

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Pedagogical Approaches of ESL Educators with an Intent-Focussing on Interaction, Time and Pace During COVID-19: Lessons Learnt

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INTRODUCTION

With the rapid move away from the physical face-to-face classroom around the world, educators are questioning if online learning adoption should continue after the pandemic, and how such a shift might affect the global education industry (Muthuprasad et al., 2021). The pandemic lasted long enough to make the educational institutions around the world use

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available technical resources to create online learning materials for students in all academic fields (Kaur, 2020).

The effectiveness of distance education strategies depends on various types of preparations. These include the preparation of the national distance education plan, the preparation of courses and support content, development of materials, the preparation of home and teaching learning support, and the preparation of monitoring and evaluation (Sari, & Nayir, 2020). However, the application of this scenario of monitoring remote learning at home to the students at the tertiary level and higher education should be further investigated.

In the Malaysian context, many lessons were learnt from the educational changes that happened due to the COVID-19 pandemic as it made educational institutes in Malaysia conduct teaching and learning activities online as an act of safety precaution to prevent the spread of the virus by reducing physical contact between educators and students (Atmojo & Nugroho, 2020; Bailey & Lee, 2020; Hartshorn & McMurry, 2020; Lukas & Yunus, 2021). Therefore, the public and private institutions were prohibited from conducting physical classes, and educators had to adapt to the new norm of conducting classes through online platforms (Yusuf & Jihan, 2020).

Additionally, the sudden shift to online teaching caused difficulties for educators in adapting to the new norm (Hamid & Khalidi, 2020). Despite the availability of several online platforms, such as Microsoft Teams, Zoom and Google Meet, there are some challenges that educators face in conducting online teaching. According to Bailey and Lee (2020), to create an effective online teaching session, the educators need to have a comprehensive knowledge on how to utilise the functions and features of the online platform. To illustrate, the physical group discussion was utilised with the 'breakout room' feature available in Microsoft Teams where students are grouped in separate virtual rooms to conduct their discussion online. As a result, the teaching performances are affected (Wen & Kim Hua, 2020) as it is challenging and sometimes impossible to attend to the students personally due to the different virtual atmosphere in online classes. The sudden shift to the online platform and the challenges confronting both the educators and the learners prompted the researchers to investigate the pedagogical approaches with a focus on interactions, time and pace of the lesson. While a face-to-face class drew responses quickly, interaction of students in online classes were restricted due to many challenges like connectivity and lack of motivation among others. Hence, strategies to

construct cognitively demanding interactions and the required time and pace to sustain the interactions were deemed important to investigate.

Literature Review: Pedagogical Approaches in Online Classes During COVID-19

The physical face-to-face classrooms were drastically transformed into online classrooms. The educators completely changed their teaching methods to cope with new and changing conditions. Most institutions strived to choose different techniques of online teaching. The use of technology was challenging for some instructors and students who were greatly dependent on it (Onyema et al., 2020).

The use of online learning in an emergency scenario has prompted experts, politicians, citizens, instructors and students to seek innovative solutions to online learning. Many universities around the world have fully digitised their operations through the urgent needs of the current situation (Agormedah et al., 2020). In this difficult period, the concern was not whether online teaching methods can deliver quality education, but how academic institutions can embrace online learning on such a large scale (Carey, 2020).

Despite several studies in the Malaysian context, such as challenges faced by primary school educators in online teaching (Lukas & Yunus, 2021), perceptions of primary and secondary school teachers about online teaching (Wen & Kim Hua, 2020), challenges faced by the students in public and private universities (Ismail et al., 2020; Nassr et al., 2020), as well as challenges faced by educators in a private institution (Yusuf & Jihan, 2020), there is a deficiency in the literature about the challenges faced by ESL educators in private universities in Malaysia. Hence, this study aims to address the present gap in the body of knowledge regarding online teaching during the pandemic.

Online Classes

While public health authorities mainly approve that the main threat of COVID-19 is best battled with proportions of social distancing, the specific acts of instituting emergency online learning procedures do not change the pandemic itself, but only indirectly by limiting face-to-face classroom interactions (Murphy, 2020). With today's technology

developments, it is critical to consider the preferences and perceptions of learners in creating online courses to make learning successful and productive. Typically, when there is a role shift of the instructor from a knowledge specialist to a facilitator in the online classroom (Adebisi & Oyeleke, 2018), instructors are expected to plan lessons that cater to the current form of online education to avoid overwhelming the students with various practical strategies (Eisenbach et al., 2020). Therefore, it is crucial for the instructors to adapt and create the most relevant and suitable pedagogical approaches to integrate more digital and online teaching methods into their classrooms (Mulenga & Marbán, 2020).

Pedagogical Intent

To adopt suitable pedagogy, the intent of the instructors is deemed pertinent. Intentionality in teaching entails the pedagogical approach that is purposeful, spontaneous and well-planned to achieve the objectives determined (Victoria Department of Education and Training, 2016). Pedagogical intent aims to produce meaningful outcomes embedded in their teaching practices and various degrees of collaborations with the students and other stakeholders (Land et al., 2020). In dealing with the challenges of online teaching, it demands greater intentionality from the instructors in comparison to a physical classroom (Jaggars et al., 2013). Therefore, pedagogical approaches with the intent to pivot time, interaction and proper pacing to produce the intended outcomes are regarded as effective in delivering online lessons as the focus of this study.

Often, online classes pose the potential of disconnection between students, their instructors and their peers (Gray & DiLoreto, 2016). Students must be kept focussed by engaging them in frequent and meaningful activities. Intentional classroom practices from the instructors yield intentional learning from the students (Kilderry, 2015). Hence, instructors are expected to practice the suitable pedagogical approaches that maximise learning opportunities (Gray & DiLoreto, 2016). Instructors with intention in teaching would deliberately select the types of learning activities, proper contexts and suitable settings to cater to the time and space of the classroom practices (Epstein, 2007). This was supported by several studies. For instance, Rapanta et al. (2020) concluded that delegating tasks or activities by allocating time properly and using video conferencing are deemed to be beneficial to substitute the synchronicity in physical

classrooms. The study showed how purposeful time planning could yield the intended learning outcomes that engage students.

Interactions During Online Classes

Online learning offers students the opportunity to engage in an analytical scenario which encourages the students to offer explanations on the tasks given (Loo, 2020). Such learning mechanisms are crucial for both instructors and students who are confined to the virtual platform that discounts the immediacy effects as in face-to-face classrooms. Clearly, previous research has established the importance of instructional practices and intentional lesson plans that anchor time and pace appropriately which eventually encourage students' interactions.

Moreover, Huggett (2014) highlighted the significance of interaction frequency in conducting online classes. This study also empathised active interaction as a pertinent element to facilitate active participation of the students throughout the learning process. Studies also demonstrated the benefit of interacting with the course instructors that aids to boost critical thinking skill and information processing (Picciano, 2002; Hay et al., 2004).

Challenges Faced by Educators During Online Teaching

Online teaching may seem to be convenient and advantageous for both educators and students but, at the same time, it also poses some challenges to educators (Bailey & Lee, 2020). Some of these challenges are discussed in this section.

Technical Challenges

Instructors are relatively unequipped with the knowledge and skill in technology in accommodating the rapid change from physical classroom to the remote classroom (Arumugam, 2020; Hamid & Khalidi, 2020). Furthermore, educators who are not experienced in the use of internet technology would find difficulty in adapting to online teaching as compared to educators who are experienced in using internet technology (Lukas & Yunus, 2021). Many of them even struggle to master the digital

skills to handle the online classes (Lim et al., 2020). Given such predicaments, they too have to structure their course delivery such that students could stay engaged and not be overwhelmed in the online classes (Eisenbach et al., 2020).

Bailey and Lee's (2020) study in South Korea found that educators that are inexperienced with utilising internet technology encounter more challenges during online teaching. For instance, if a student faces technical issues, an educator who is not experienced with internet technology would find it hard to assist the student as he/she is not familiar with how the device functions (Bailey & Lee, 2020). Hence, online teaching is perceived as a great challenge because the instructors need to familiarise the students with the features and functions of online learning platforms to eventually encourage active engagement (Loo, 2020). Educators who had prior knowledge and expertise with internet technologies had far less difficulty than those who did not. Thus, an important criterion will be that instructors must get training in order to give online classes (Pellegrino & Hilton, 2012).

According to Lukas and Yunus (2021), Sepulveda-Escobar and Morrison (2020), Mishra et al. (2020) and Yusuf and Jihan (2020), one challenge faced by educators is poor internet connection that would possibly disrupt classroom practices. Apparently, online teaching relies heavily on strong internet connection to establish communication and create an efficient online teaching session (Ismail et al., 2020; Wen & Kim Hua, 2020), hence, poor internet connection hindered educators from establishing a successful online teaching experience (Lukas & Yunus, 2021). Failure to conduct classes smoothly due to technicality might contribute to demotivation, loss of passion as well as less focus for students, which eventually affect course delivery (Guri-Rosenblit, 2018) and would hinder the instructors from setting the right atmosphere and achieving the expected learning outcomes of the lessons planned (Epstein, 2007).

Readiness of the Instructors

Additionally, the readiness of the educator in adapting to online teaching is another challenge in online teaching because teaching with an intent requires extensive knowledge, skills and expertise to plan and to shape the learning experiences in mindful and purposeful manners (Epstein, 2007), let alone online teaching which is considered as a different learning facet to both instructors and students.

The sudden shift of physical classroom to online classroom amid the pandemic added more difficulty for the educators in Indonesia and Malaysia because it was not planned and prepared prior to the pandemic (Atmojo & Nugroho, 2020; Lukas & Yunus, 2021). This assertion was supported by Hartshorn and McMurry (2020), as they pointed out that TESOL Educators in the United States expressed that they face difficulty when transitioning from the traditional physical teaching method to the new online teaching. To be intentional, the instructors are required to be ready in setting the right learning environments which are purposeful and allow ongoing practices that inspire students' learning experiences (Land et al., 2020). However, online teaching that requires constant efforts and adaptations from the instructors have, to a great extent, impinged the readiness of them. Intentional teaching demands specific mindset and goals to shape meaningful learning experiences as promoted in intentional teaching (Epstein, 2007). Hence, instructors face a challenge on intentional teaching due to the sudden shift from the physical to virtual classrooms.

Challenges: Interactions, Time Management and Appropriate Pacing in Online Teaching

Interactions During Online Classes

The challenges faced in online learning could be facilitated by exploring the instructors and learners' perceptions. In the present study, the role of interactions, time management and appropriate pacing was explored from ESL instructors' perspective to find solutions to facilitate the teaching and learning process.

The convergence between pedagogical goals and unfolding classroom interaction as one of the important means of creating learning opportunities for students (Seedhouse, 2019; Sert & Jacknick, 2015; Walsh, 2011). Kedraka and Kaltsidis (2020) reported that students perceive remote learning as fascinating, modern, sufficient and convenient, but not able to replace the social connection they have with their classmates and professors. Moreover, classroom discourse is framed by pedagogical purposes, and therefore, to promote good interactions, the instructor used questions that require critical thinking skills to elicit good responses from the learners. In a study on students' perspectives towards online teaching and

learning in higher education during the Coronavirus pandemic, Coman et al. (2020) explored how Romanian universities managed to provide knowledge during the Coronavirus pandemic. They analysed students' perception regarding online learning, their capacity to assimilate information and the use of e-learning platforms for 762 students from two Romanian universities. The results indicated that students deemed lack of appropriate interaction with teachers or poor communication with them as a significant barrier of their learning. Online mode is not favourable when students have more flexibility and freedom of choice; however, it helps to promote a feeling of community to achieve common goals in the learning process (Boling et al., 2012).

In fact, the main motives for high participation could be associated with more time, no obligation to go to school and better teaching environment that facilitates participation in the classroom (Karalis & Raikou, 2020). Zhang and Lin (2019) explored student interaction and the role of the instructor in a virtual high school and examined the factors that predict online learning satisfaction. They found that at the student level, learner-content interaction was the sole significant predictor of satisfaction, whereas satisfaction was favourably and substantially connected with instructors' acceptance of pedagogical roles, but adversely predicted by their adoption of managerial roles. In the context of K-12 global language acquisition, the findings emphasise the significance of content-based teaching and learning. Distance learning gives students more time to study, even though distance learning still has technical limitations, such as poor internet connection (Amir et al., 2020). According to Karalis and Raikou (2020), 55.3% of the student participate more actively in online class compared to face-to-face class lessons.

Time Management in Online Classes

Time management is a crucial factor in learning and teaching for the students and instructors. Time management learning and teaching strategies could be interrelated as teachers' way of managing time which will also affect students' time and vice versa. According to Min Shi et al. (2006), who explored time management strategies for online teaching, teachers should create time management skills when moving to online teaching. In a qualitative study, they conducted interviews with students from successful online graduate programme and presented the distinctions of time-related issues between face-to-face and online courses. They stated that,

for example, the importance of clear and concise writing of the course materials cannot be emphasised enough in online teaching. In the previous studies, most of the teachers reported that the time spent on preparation for distance learning increased compared to face-to-face teaching, but the time spent on student participation in the assessment decreased (Karalis & Raikou, 2020).

Furthermore, despite the necessary ICT facilities, there might be other deficiencies, such as the lack of preparation time, and the lack of support for curriculum design and review (Vrasidas, 2015). Students' time management during online class was investigated by Batbaatar and Amin (2021) who analysed the influence of online learning, academic procrastination, stress and self-regulation on undergraduate learners' time management during COVID-19. The results showed that online learning and self-regulation had significant influence on students' time management, whereas stress and academic procrastination have no significant influence on the time management of the students. One way of managing such interactions would be letting students take responsibility for their task completion. For example, Morgan and Saxton (1994) stated that wait-time is "an active silence" in which students can think and develop a response for the questions raised by the instructor. Such democratic method would help students have quality time spent on the tasks.

Appropriate Pacing in Online Classes

With regards to the consistency of students' pace in online learning, Hershkovitz and Nachmias (2009) examined the consistency of students' behaviour about their pace of actions over several sessions within one online course. In their study, pace was operationalised as "the number of logged actions divided by session length (in minutes)' (p. 71). The datasets investigated for pace rank consistency in day/night sessions, beginning/end (for both situations, sessions of the same learning mode were taken) and different learning modes. The finding indicated pace was rather inconsistent, hence not necessarily a characterising measure for the whole learning period. Most students enjoy online learning as they are free to choose the time and progress of online learning, and they understand it according to their own pace (Yates et al., 2021).

According to Adnan and Anwar (2020), students can learn faster in online mode as e-learning requires 40–60% less learning time than traditional classrooms. Students can learn at their own pace, revert and re-read,

skip and learn concepts in online mode of learning with their own will and preferred styles. Moreover, the use of personalised learning has been found as significant factors in teacher's perception in the previous studies. For example, understanding how instructors employ personalised learning techniques, such as varying the pace of instruction and the resources available to students, is critical since research shows that many students graduate lacking the intellectual, interpersonal and intrapersonal skills needed for success in college and in the workplace (Scott-Clayton & Rodriguez, 2015). As supported by Hill and Fitzgerald (2020), online education allows teachers and students to set their own learning pace and can flexibly set a schedule that fits any agenda. Similarly, Gray and DiLoreto (2016) highlighted the importance of designing suitable lessons that maximise students' learning experiences such as personalised task. Additionally, Cheung (2021) pointed out that educators who already had knowledge and experience in using internet technology faced much less difficulties compared to those without the knowledge. This is also supported by Yusuf and Jihan (2020) who concluded that instructors need training in order to know how to conduct online teaching. Therefore, considering the context and background of the present study, we explored the pedagogical approaches adopted by the ESL educators focussing on interaction, time and pace and describe the social challenges that the ESL educators face with regards to interaction, time and pace.

Methodology

With the sudden shift to online platforms due to the outbreak of the pandemic, ESL instructors were left with the dilemma of conducting classes online successfully as well as having meaningful interactions with their students. Monitoring students online was a challenge and hence with a focus on the interactions, time and pace during the COVID-19, this study investigates the challenges faced by ESL educators during online teaching at a private university in Malaysia.

The research design of the present study is qualitative. Semi-structured interviews were conducted with eight ESL instructors at a private university in Malaysia. Convenience sampling method was used for the selection. The interviews were transcribed, and themes were identified in response to the questions investigated. The selection criteria for purposefully selecting the participants for the interviews were minimum three years of teaching experience, willingness to be interviewed and observed (randomly),

willingness to go through member-checking after the interviews and observations and teaching at least one online ESL class at the time of conducting this study. The collected data were analysed thematically. Thematic analysis has proved to be an effective method to gain in-depth understanding of a phenomenon.

Apart from interviews, online classroom observations for a period of one semester consisting of three hours each for one week via Microsoft Teams and field notes were used to collect the data and it was validated with the respective lecturers. The interview followed what Patton (2002) referred to as the interview guide that is "free to explore, probe, and ask questions that elucidate and illuminate that particular subject" (Patton, 2002, p. 343). As for the observations, a checklist was designed based on the thorough literature review and the context of the study.

The interview questions and observation checklist were all validated by three content experts and revised for the content and flow improvements according to the feedback given. The validators had PhD in an English-related discipline with a minimum of five years of teaching experience with prolific research background.

The present study aimed to answer the following research questions through interviews and classroom observations:

1. What are the pedagogical approaches adopted by the ESL educators focussing on interaction, time and pace in the online class?
2. What social challenges do the ESL educators face in terms of interaction, time and pace in the online class?

Findings and Discussion

Pedagogical Approach: Interaction with ESL Students in Online Lessons

The findings on interactions of instructors with students elicited two main themes, namely *management of interactions* and *self-reporting* employed by the educators to engage students. These findings were attained through interview, observation and field notes.

Management of Interactions Through Effective Communication Style
According to Dhillon and Kaur (2021), communication effectiveness captures the fundamental interaction of language and medium (verbal and

nonverbal). When it comes to the teacher–student interaction, perspectives vary based on the students' personality and their particular learning preferences. The findings in the present study indicated that the instructors could not implement a teaching style to the entire class as different students had different cognitive levels of understanding. This is in line with Zhang and Lin's (2019) finding that satisfaction was associated with the acceptance of instructors' pedagogical roles. Also, the instructors in the present study opined that this implied limited opportunities for students to interact with lecturers due to the constraint of the online classroom where students and lecturer were situated in a different learning atmosphere and therefore, the instructor had to manage the interaction by integrating effective communication with the students. The instructor highlighted,

Instructor 1: "The communicative activities promoted interactive atmosphere and provided them with opportunities for self-expression".

The instructors explained that they altered the pace of interaction focussing also on other students not willing to interact in the online platform. To further encourage them to interact, instructors encouraged the students to use the reaction icon in the Teams platform to enhance participation in the class. To motivate the students to speak, the instructor in the present study used mostly communicative activities to create a conducive and non-threatening atmosphere to elicit responses. These findings are consistent with Karalis and Raikou's (2020) findings which reported that group chatting during online teaching is seen as beneficial by most students.

The instructors also monitored interactions through other means as well. Most of them opined those routine interactions, such as calling out names for attendance, checking their presence online after break received instant replies compared to task-related interactions. This scenario was quoted by Instructor 6:

Instructor 6: Are you guys back to class? Can you raise your hand to indicate your presence in class?

Students: Instantly raise their hands to show their presence.

Analysis of the findings in the present study indicated how instructors created interaction with the students during online class by asking them to apply the features of the online platform, that is, Microsoft Teams. Instructors needed to get the students familiarised with the features of the learning platform. However, challenges arose where students were passive and non-responsive.

Instructor 6: When I asked, "Ok, who is going to share screen now? Which group wants to present their findings first?"

Met with silence, until I keep asking and finally resort to calling them by names.

Through the observation, there was noticeable silence in the class when group assignments were given and there was reluctance to reply when given the option to lead. The instructors also opined on having to divide the attention between those attending online class and those who were present in the physical class. This online learning raised pertinent questions on the nature of the interactions which now resorted to routine checking on their presence in class as well as to check their comprehension. Most of the instructors felt that this compromised the quality of the interactions as shared by one of the instructors quoted below.

Instructor 3: "Previously, I was able to check their interactions within a group but now, I only assume that interactions take place in the chat rooms because I have to keep checking on many chat rooms."

It was found that in order to have deep interactions with students, the instructors raised pertinent questions related to the context and the content of the lesson. For effective communication in the classroom, the instructors believed that providing the learners with challenging, comprehensible and scaffolding input and feedback is crucial. Moreover, the educators posted discussion questions together with links of videos for students to watch and relate to the discussion questions which promoted engagement and discussion among the groups. Finding also showed that a majority of the educators viewed socio-constructivist beliefs positively and hence encouraged collaboration among learners in groups.

Instructors' Use of Self-Reporting Strategies in Online Classes

This study mainly stresses the instructors promoting effective learning through students' interactions. The instructors used self-reporting to gauge the interactions of the students. Instructor 2 reported on how she used the self-reporting in a literature class as follows:

Instructor 2: "Students were given a series of questions to answer within a limited duration and questions set were related to the context of the lesson but that requires critical thinking skills. However, the interactions I received were limited to few sentences."

While interactions were found effective and useful in some instances, it did not work well for the complex topics. Therefore, the educators had to set clear instructions and guidelines to create a safe space for interactions

to take place. Most of the instructors stated there were challenges faced during the online classroom.

Instructor 1: "At first, I felt challenging when students were reluctant to interact, but I spoke more to them and figured out that by giving scenarios they are able to interact and contribute more. Hence, I used this strategy, sometimes a picture and so on to get them to interact".

It should be noted that the validity of the *self-reporting* results by the participants depends on a number of factors that are outside the control of the researchers, such as participants' honesty, their willingness to report their emotion, and the accuracy of participants' perception about their emotions (D'Mello & Graesser, 2010). Aside from that, it could possibly be attributed to the synchronous online sessions, and that the delivery of information took up a substantial portion of the lesson time, leaving little opportunity for student discussions and engagement (Moorhouse & Tiet, 2021).

Analysis of the data about the teachers' perceptions towards factors causing different interaction responses revealed that the quality of the classroom interactions relates to some students' tendency to resort to short utterances when the educators attempted to get detailed responses from the students. These interactions were not greatly controlled, as the educators' encouraged responses, even allowing participants to pause, reconstruct the sentence and be brief before allowing the other participants to continue. The educators interviewed in this study also expressed that peer discussions were less effective in these circumstances as those students worked individually before presenting their work, sometimes as fragments of the whole group.

The findings of the present study also showed that the ESL educators engaged the students in different ways because of the different perceptions of the students towards online teaching and learning. In the present study, the students' perceptions were approached from the instructors' point of view, that is, the way instructors viewed the learners' reactions, responses and attitude towards online teaching. The findings indicated that by preparing the information ahead of time, synchronous lesson time may be freed up for discussions and group projects, resulting in more interaction between teacher and students during online sessions. This finding was also supported by Ismail and Abdulla (2019). Most of the lecturers in this study believed that quality interactions were possible only for a small class size, whereas large classes mostly shifted to interactions compared to small group interactions.

Pedagogical Approach: Time Management in Online Lessons

Time was reported to be one of the key factors that largely affected the learning and teaching process. With regards to this, *giving extended time*, and *positive reinforcement and patterns of interaction* were identified as the main themes.

Giving Extended Time in Online Classes
The instructors noted that the concept of time took a different meaning, as now in the new norm it means having to join the chat rooms to listen to the interactions. Hence, the instructors could not remain in one chat group for long and sustained interaction was not possible due to the perceived notion of time under the circumstances. The following quote indicates the constraint of time during the class time.

Instructor 4: "I felt that I was not paying enough attention to all the groups as I had to go into individual chat groups to monitor all of them".

Most instructors lamented the time spent on activities in the classroom as the students were concerned about task completion, thus, producing a minimal amount of work. This eventually resulted in poor quality of discussions. This is in accordance with Garrison et al. (2001) findings which supported proper time allocation allowing students to develop critical thinking skills and enhance communication with their peers. Educators could also clearly communicate their expectations and the role of students at the onset of the activity to the students. However, not all students responded proactively as reported by Instructor 4 who highlighted the issues of connection which affected the lesson.

Instructor 4: "Some students spend minimal time on a task, distracted most of the time citing poor Wi-Fi connections."

During the observation, learner engagement was found to be a challenge, as some students lost concentration. Some instructors varied the use of class time activities by giving tasks one by one to maintain the dynamics of the class. This was distinctively enjoyable both for the instructors and the students and the clever variation in the use of time worked well in some classes. However, the following is an observation by one instructor on the challenges faced when students lost concentration. This highlights the need to plan spontaneously to accommodate students' distractions.

Instructor 5: "I have 2 hours of lessons and by the end of 1 hour most of them have lost their concentration and I get no responses from them and often I have to plan something ad hoc to get their attention".

The findings on time management styles put forth the need to highlight the constraints of time in the online learning atmosphere. This scenario is in accordance with that of Ali (2020) who reported the COVID-19 pandemic and social distancing requirements presented challenges to all stakeholders especially educators because educators must work with limited time and resources. In the present chapter, it was found that educators spent less time during online teaching as they had to spend more time accomplishing tasks than active engagement. It was also found that although educators possess different views with regards to time management, the online learning environment created additional learning experiences that allow learners to interact, collaborate and master their own learning at their time. This was also supported by Ali (2020).

Nevertheless, on the concept of time, while some instructors in the present study believed it was advantageous to the students, others believed physical classes promoted a better concept of time. Most of the instructors believed that social interactions could give impetus to discuss and clarify doubts. Some instructors perceived that students watched the recorded version of the lessons while they were "too relaxed" and not paying full attention during lessons in real time of the class.

Positive Reinforcement and Patterns of Interaction
Another theme relates to the positive reinforcement in association with time allocation. Most educators believed that more often they were required to motivate students to engage in tasks within the time frame they set for the class activities. While some instructors stated that group discussions generated positive reinforcement, the others perceived that individual task elicited more responses:

Instructor 8: "The students were willing to respond when they were motivated to say something".

Also, the majority of the educators noted that the allocated time limit to an online class and the physical class could be different.

Instructor 5: "I used to set 20 minutes for a task but now online they reported that the task was completed in 10 minutes. I had to use positive reinforcement to motivate them to give in-depth answers as I found out that the discussions were shallow".

Pedagogical Approach: Appropriate Pacing in Online Lessons

Analysis of the results revealed that maintaining an appropriate pace during class lessons was considered by the instructors in engaging students. The main theme derived was the *personalisation of tasks* for students during online learning.

Personalisation of Tasks with Pace

Personalised learning is a set of instructional approaches and school settings that allow students to choose their own learning experiences and routes, and seek to tailor learning to the strengths, needs, abilities and interests of each student (Scott-Clayton & Rodriguez, 2015). In the present study, most lecturers viewed pace as the most important factor to monitor the progress of the lesson and students' comprehension. They stated that the slower the pace, the more students were willing to clarify doubts. While a fast-paced lesson drew total silence on the part of the students. Also, there was less chance for the educators to check on comprehension and clarification as shared by the educator below.

Instructor 3: "I had to manifest at a different pace with different topics, and I felt I could dwell more on certain topics".

Some instructors stressed the necessity for the slower pace considering the nature of the online lessons. Most students requested either to repeat, or they were unclear about the instructions. Also, it was found that certain aspects of the lesson like assignment guidelines, classroom rules and presentation dates required slower pace as the educators had to ensure complete understanding from the class. The educators also mentioned that uploading materials in the Teams platform beforehand helped them to determine the pace of the lesson in a more structured and organised pattern.

Instructor 2: "Giving them a preview of the next lesson and some articles to read helps me to better pace my lesson as there are some slow learners in my class".

The educators also drew attention to the variations in pace regarding the length of the lesson. Lessons that lasted less than an hour were paced reasonably well with intervals for questioning and down time, but not for the continuous three-hour classes. It was observed that the second half of the lesson was slow paced by the educators as most students were distracted and did not respond to the questions posed. This was ascribed to the monotony of the online classes and the lack of dynamics in the

classroom. It should be noted that social interaction is an advantageous characteristic of physical classes.

Instructor 8: "It was hard to pace the lessons online as I had to go in each chat room to monitor what was happening. Some of the chat rooms I noticed were quiet and I had to intervene to remind everyone to participate".

As stated above, the main challenge was to determine the learning pace of the students and the interactions that took place in the online classrooms as reflected by the uncertainty of perceptions by the educators. The predicament was especially believed to be crucial when the university is closed, and students are no longer in the classroom, whereby such transformation requires rapid mobilisation of all university staff and resources. Personalisation was found as one of the pedagogical characteristics that affects learners' experiences and could facilitate learner access to tailored activities that create a sense of ownership and control the learning.

To address issues such as losing concentration and boredom as the reasons for students' loss of track with the lessons in the previous studies (e.g., Wen & Kim Hua, 2020), we found that the ESL instructors in the present study formed chat groups, posed discussion questions and YouTube videos to overcome the challenges. They believed this made the interactions among students more engaging. This was observed through students' responses in the classroom as well.

The above findings postulated that educators in the present study were confronted with various pedagogical challenges. This indicates that the online classes require extensive efforts by the educators to accommodate the shift of the learning platform from physical to the digital. The instructors faced challenges in teaching approaches and methods which also hindered efficient online classroom practices.

DISCUSSION

In this chapter, only instructors' challenges were explored, and students' challenges were beyond the scope of the study as the participants were instructors. While employing effective methods and using different activities in resorting to the various classroom atmosphere, instructors faced challenges, such as students' inactivity, attention deficiency and less extensive responses from the students. This result is supported by the findings of Ferri et al. (2020) which highlighted that the lack of interactivity and motivation among students is related to the social challenges, for example, losing human interaction between the teachers and students, as well as

among the students. Students' social challenges were beyond the scope of this study which only focussed on instructors.

It can be concluded that during online teaching sessions, instructors faced challenges, such as the lack of student participation, poor internet connection and the educator's readiness to adapt to online teaching. In this study, the ESL instructors' challenges in online teaching particularly with regards to classroom interactions, time and pace, as important aspects of online teaching and their solutions were described in detail. In dealing with the shift of classroom practices from physical to online platforms, instructors need to adapt quickly and follow the guidelines and recommendations that are issued continuously by the authorities, within an almost "real-time" process. Teachers are encouraged to plan proactively for time management demands connected with a combination of remote, and online courses in addition to adopting general time management practices. Online education could help teachers and students set their own teaching and learning pace and can flexibly set a schedule that fits any agenda. Therefore, designing suitable lesson that maximise students' learning experiences, such as personalised task, could be advantageous for the students.

The findings on the significance of the interaction, time and pace indicate that online instructors would need to adjust their teaching approach and methodology in the context of the less "personal" e-learning. For instance, level adjustment and simplification strategies could keep students focussed and engaged in the lesson. Moreover, effective time management could keep the instructors and students motivated and "on track." Finally, intentionality in teaching could also contribute as it entails mindful, purposeful and pre-planned instructional practices that ensure the anticipated learning outcomes.

Conclusion and Recommendations

The drastic implications of COVID-19 resulted in a temporary halt in several aspects of daily life, including education. Because of the pandemic's impact in Malaysia, all lessons were held online. Many countries implemented steps to reduce the number of people congregating in public areas after the COVID-19 pandemic. The routine operation of schools and universities was hampered as a result of these actions. Many universities employ online teaching and e-learning technologies, especially after

COVID-19, as a primary medium of delivery for their distant curriculum, as well as a form of support for traditional teaching.

This chapter suggests some practical implications to the stakeholders. A strategy that can be used by educators to encourage students' participation is planning interactive activities for the students. These activities are suggested to involve appropriate and adequate interactions, time and pace. University educators would have to plan and initiate creative activities that can nurture the students' enthusiasm and motivation for online learning with sufficient time allocated to ensure students have enough space to develop critical thinking skills. As Boling et al. (2012) stated, "it is now more important than ever for online instructors to provide students with experiences that challenge their higher-order cognitive skills as opposed to simply transferring content to them" (p. 118).

Also, pacing the lesson properly promotes students' interactions as the students could stay involved in the class activities while remaining engaged with their peers. It is noteworthy that the shift of educational landscape requires greater pedagogical intent of the instructors that pivot effective course delivery. The choice of activities impacts the amount of time spent on various tasks and are thus a key factor of time management success.

Another implication from the findings of the study could be raising awareness on the importance of conducting online teaching workshops and training by the consultant or educators to address the social challenges. Institutions could provide such workshops to support both technical knowledge and online classroom pedagogy. Organising online teaching workshops can prepare the educators to conduct online classes and have a long-term benefit for the educators (Mishra et al., 2020).

Moreover, supporting governments in developing successful forms of online education will enhance institutional capacities and resources. This could allow the educators to provide alternate learning methods for students.

Finally, it is crucial for instructors to understand the cultural values, norms and background of the students, as well as the social context of the lessons. Such awareness by the educators could help them identify the types of workshops that they need to attend, for example, on classroom management, and for a more comprehensive understanding of the learners, their needs, preferences and expectations.

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Beyond the Effectiveness of Online Learning in the COVID-19 Pandemic: A Perspective of Hong Kong University Students' Well-Being

Weiyan Xiong

INTRODUCTION

The outbreak of the COVID-19 pandemic in early 2020 has dramatically impacted higher education teaching and learning worldwide (Farnell et al., 2021; OECD, 2021). Among all impacts, the sudden transformation from face-to-face classes to online teaching and learning has brought many challenges to university students, instructors, and administrators due to unpreparedness in various aspects, including the mental preparation for online teaching and learning, the course design and delivery, online teaching pedagogical skills of instructors, and the administrative

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and technical support for online teaching and learning at the university level.

Many studies of the pandemic impacts on higher education teaching and learning focus on the effectiveness and assessment fairness of "emergency online learning" in higher education institutions (e.g., Baber, 2021; Khan, 2021; Mok et al., 2021; Montenegro-Rueda et al., 2021). In addition to this instrumental perspective, university students' physical and psychological well-being has also been increasingly attracting attention in academia because the actual online teaching and learning practices during the pandemic have revealed that students are experiencing mental stress and physical discomfort when taking online classes (e.g., Chandra, 2021; Prasath et al., 2021; Zhai & Du, 2020).

Against the context of the broad application of online teaching and learning during the pandemic, this chapter aims to specifically explore Hong Kong university students' well-being in online learning. Also, this chapter hopes to provide implications derived from Hong Kong university students' experiences to assist higher education institutions and instructors in enhancing students' physical and psychological well-being by restructuring course design and delivery and providing relevant professional development programs. Specifically, this chapter aims to explore two research questions:

1. What are the well-being challenges for Hong Kong university students in online learning during the COVID-19 pandemic?
2. What are Hong Kong university students' responses to these challenges?

In May 2020, the author and colleagues conducted a survey to examine Hong Kong university students' online learning experiences during the pandemic. The research team received 1227 valid responses. Guided by the two research objectives and questions, this chapter selected the well-being-related survey questions to conduct the descriptive analysis of the collected data. Specifically, these survey questions include (1) How does online learning affect your study compared to the face-to-face class? (2) What challenges have you faced in online learning? And (3) To what extent will the following factors impact your online learning experiences?

This study finds that the sudden transformation to online learning has brought many issues related to Hong Kong university students' physical (e.g., eye fatigue) and psychological (e.g., increased mental stress) health.

The primary reason behind these well-being-related issues was the unpreparedness of university students and teachers to the sudden transition from face-to-face classes to online platforms. Physically, the courses initially designed for the face-to-face format did not adapt well to online learning using electronic screens. Meanwhile, mentally, students are faced with much pressure derived from their unfamiliarity with online learning technologies. This issue has been worsened by some instructors' struggles with online teaching tools to maintain teaching effectiveness and student engagement. In Hong Kong, these issues have been augmented by the compact living situation of some university students from low-income families.

This chapter is organized in the following fashion. First, a literature review examines the current research on the impact of the COVID-19 pandemic on higher education teaching and learning with a particular focus on students' well-being. Second, the research method and results are presented. Third, a discussion and a conclusion of the findings are offered. Finally, the implications of the findings are presented at the end of the chapter.

Literature Review

Pandemic Impact on University Students' Well-Being in Learning

The impacts of the COVID-19 pandemic on higher education teaching and learning have been widely researched since its outbreak in early 2020 (e.g., Chandra, 2021; Farnell et al., 2021; Mok et al., 2021). One of the immediate and most profound impacts of the pandemic was the surged development of online teaching and learning in higher education (Mullen, 2021). In the form of "emergency online teaching," the pandemic has forced online platforms, especially for live streaming teaching and learning, to be at the center of higher education, different from online platforms' previous complementary role in face-to-face classes. Meanwhile, live streaming or synchronous courses have replaced the asynchronous formats (e.g., MOOCs and Coursera), becoming the primary course delivery approach (Farnell et al., 2021). Positively, the online platform has guaranteed the continuity of the education process during the pandemic (OECD, 2021). Meanwhile, credentials obtained through online degree programs have been widely recognized by the accreditation bodies and

labor markets (Kis, 2021), which used to be a controversial or debatable issue before the pandemic. From a long-term perspective, online teaching and learning would become an integrated part of future university education, even after the pandemic ends and students return to the classrooms (Mok et al., 2021).

However, the sudden transition to online platforms has brought university students many challenges in their learning experience and physical and mental health. University students from different parts of the world adversely impacted by the COVID-19 pandemic have experienced challenges in physical and psychological well-being and emotional frustration in online learning (e.g., Aristovnik et al., 2020; Baloran, 2020; Farnell et al., 2021; Flores et al., 2021; Rodríguez-Hidalgo et al., 2020; Son et al., 2020; Spatafora et al., 2022; Zolotov et al., 2022). Generally, empirical evidence indicated that the level of university students' well-being during the pandemic was dramatically lower than before (OECD, 2021; Prasath et al., 2021). Psychologically, university students felt anxious, bored, lonely, and even depressed when taking online courses at home, and these negative emotions came from the sad news about the pandemic, the worries about their academic performance and future employment, and the lack of personal interactions due to the quarantine (Cao et al., 2020; Johnson, 2022). In addition, university students felt exhausted in online classes because they needed to put much more effort into online learning due to the lack of social clues like actual eye contact and body language (Scott, 2020). Physically, because of the dramatic decrease in exercises and activities and the overuse of electronic devices, stay-at-home online learning also impacted university students' physical well-being (Chu & Li, 2022). Also, the long-time staring at electronic screens also led to the issue of visual function impairment for university students (Fan et al., 2021).

Particularly, literature has identified academic stress as a major psychological well-being issue for university students in online learning during the COVID-19 pandemic (Johnson, 2022; O'Byrne et al., 2021). University students' online learning stress was derived from their unpreparedness for online learning and teaching practices, where they missed face-to-face classroom and interpersonal interactions (Chandra, 2021). They were also concerned about the application and fairness of the class assessment and assignments (Montenegro-Rueda et al., 2021). Additionally, the research found that university students' academic stress was also attributed to external conditions, including the difficulties of

using online learning technologies in the abrupt transformation from face-to-face to online (Johnson, 2022), inadequate or low-speed Internet access (Bisht et al., 2022; Hoover, 2020), and the poor learning atmosphere due to the interruptions from their families' daily activities at home (Mok et al., 2021).

Responses to University Students' Well-Being Challenges in the Pandemic

Countermeasures to address university students' well-being challenges during the pandemic have been discussed at different levels. At the institutional level, many higher education institutions established risk management systems to deal with pandemic challenges, in which alleviating students' mental stresses through psychological and social support was one of the priorities (Huang & Zhang, 2021).

At the course level, given the positive influence of social interactions on online learning effectiveness (Baber, 2021), the community of inquiry (CoI) framework has been emphasized and proposed by scholars to be applied in online teaching to increase the social presence of students and instructors, which could increase the social interactions and reduce students' loneliness in online learning (Mullen, 2021). Research also proposed that universities and instructors should comprehensively integrate the online elements into their pedagogy (Carrillo & Flores, 2020) and provide sufficient support to students to learn new technical skills to cope with negative emotions in online learning. Familiarity with online learning technologies has been proven effective in reducing university students' academic stress (Chandra, 2021; Händel et al., 2020).

At the individual level, feeling secure by following the hygiene regulations to avoid infections has been treated as important in relieving stress during the pandemic (Baloran, 2020). At the same time, seeking social support from significant others, like friends and teachers, has been proven helpful in overcoming the challenges in online learning (Huang & Zhang, 2021).

In summary, the existing literature argued that university students could focus on their learning instead of being distracted by minimizing and removing the negative impacts of physical and psychological challenges in online learning at different levels. Moreover, social support can equip university students with positive attitudes, resistance, and flexibility

toward online learning difficulties (Huang & Zhang, 2021). In this way, university students' learning effectiveness and experiences can be improved.

Research Method

This chapter is based on the well-being-related data of a quantitative study conducted in May 2020, when the COVID-19 pandemic overwhelmingly impacted higher education teaching and learning (Xiong et al., 2020). The author and his colleagues distributed a survey questionnaire to Hong Kong higher education students to explore their overall online learning experiences during the pandemic, such as their overall satisfaction rate, online learning effectiveness and challenges, and a comparison between onsite and online learning. The research team received 1227 valid responses from eight public universities and other higher education institutions in Hong Kong. The ethical approval for the data collection in this study was obtained from Lingnan University, Hong Kong, before distributing the questionnaires. Of all respondents, 67.7% were female, and 32.3% were male. Respondents' study levels ranged from associate to doctoral programs, but most of them (70.8%) studied in the undergraduate programs, followed by associate students (18.6%) and postgraduate students (18.6%).

As mentioned above, this chapter selected three survey questions relevant to the two research questions about Hong Kong university students' well-being challenges and responses in online learning. The first selected survey question, "How does online learning affect your study compared with the face-to-face class?" used a three-point Likert scale to examine the impacts of online learning on respondents' learning experiences. The respondents were invited to compare their learning experiences before and during the pandemic to examine how emergency online learning impacted their study. Specifically, respondents evaluated that in online learning, if their daily study time, efficiency, and pressure "increase," "have no change," or "decrease" compared with face-to-face learning.

In the second selected survey question, "What challenges have you faced in online learning?" Hong Kong university students were invited to identify the challenges of taking online courses during the pandemic. The questionnaire provided ten options, including "poor quality of learning," "poor learning atmosphere," "lack of interactions," "no timely feedback," "time conflict," "unstable Internet connection," "distractions from surroundings," "eye fatigue due to long-time staring at the screen," "lack of

self-discipline," and "other challenges." Respondents could choose multiple challenges they identified.

The third survey question, "To what extent will the following factors impact your online learning experiences?" invited respondents to evaluate how different factors impacted their online learning experiences. Through a three-point Likert scale with "no impact," "neutral," and "strong impact," respondents could indicate their attitude to the following five factors, "stability of Internet connection," "appropriate use of teaching materials (e.g., PPT)," "in-class interactions," "after-class consultancy with instructors," and "availability of class recordings."

After the descriptive analysis, the result section below presents the impacts of emergency online learning on respondents' study, the online learning challenges, and factors influencing online learning experiences.

Results

In the survey study, the research team first investigated Hong Kong university students' overall satisfaction with their online learning experiences during the pandemic, and only 26.89% of 1227 respondents felt satisfied (Xiong et al., 2020). The low satisfaction can be viewed as a background for investigating Hong Kong university students' well-being-related challenges and responses. This section presents the results of three selected survey questions through the descriptive analysis of collected data.

Impacts of Emergency Online Learning on Hong Kong University Students

The responses to the first selected question demonstrated that the sudden transformation from face-to-face learning to the online platform increased respondents' study pressure while decreasing their study efficiency (see Fig. 7.1). For the study time, respondents had different opinions with 31% finding their study time increased but 42% thinking in the opposite way. Notably, about half of respondents felt that their study efficiency decreased (53.71%) and study pressure increased (48.00%) in online learning compared with face-to-face learning, which demonstrated a negative impact of emergency online learning on respondents' learning experiences during the pandemic.

Specifically, "study pressure" is closely related to students' psychological well-being, and around half (48.00%) of respondents felt the
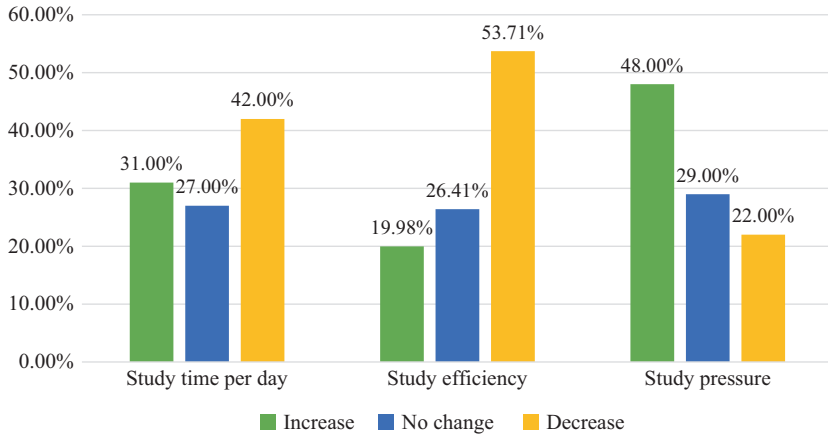
Fig. 7.1 Comparative with face-to-face learning, how emergency online learning impacted respondents' study

emergency online learning increased their study pressure during the pandemic. To a large extent, the increased study pressure could be attributed to the challenges of online learning met by respondents during the pandemic, which would be discussed in the following section. In addition, the existing literature can shed light on the causes of the negative impact of emergency online learning on respondents' study time, efficiency, and pressure. On the one hand, given the sudden transition, students would take more time to get familiar with the online platform in addition to the class preparation (Chandra, 2021), which increased their study time (31.00%). However, 42.00% of respondents also found the study time decreased, and the reason might be that they separated the time of getting familiar with the technologies from the actual study time. On the other hand, the decreasing study efficiency could be attributed to the unpreparedness of instructors in online teaching and the lack of sufficient interaction and timely support during and after the class (Mok et al., 2021). These factors combined to become an online learning stressor for respondents, who felt much pressure during online learning compared with face-to-face classes.
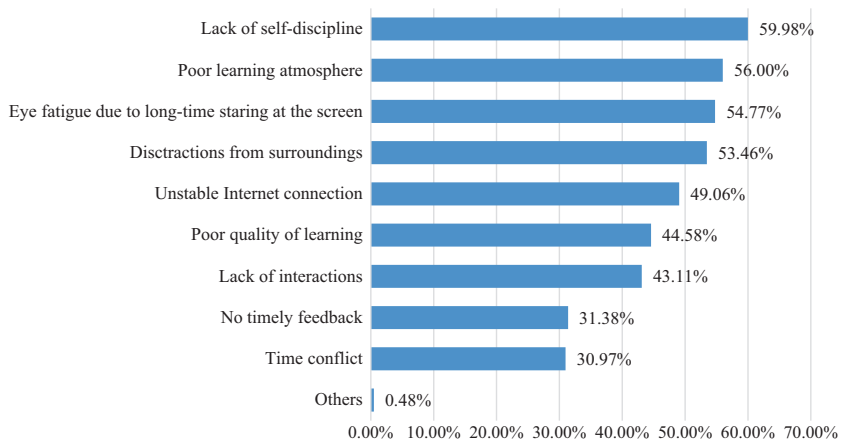
Fig. 7.2 Challenges to respondents' online learning during the pandemic

Challenges of Online Learning During the Pandemic

As Fig. 7.2 depicts, the top three challenges of online learning faced by respondents during the pandemic were "lack of self-discipline" (59.98%), "poor learning atmosphere" (56.00%), and "eye fatigue due to long-time staring at the screen" (54.77%). With a focus on university students' well-being in online learning during the pandemic, this section mainly discusses the challenges related to respondents' physical and psychological health.

"Eye fatigue" has been highlighted by more than half of respondents (54.77%) as a major challenge in online learning. Regarding respondents' physical well-being, the high rank of eye fatigue among challenges has brought attention to the pandemic impact on students' physical health in emergency online learning. While many studies focus on the learning effectiveness of emergency online learning, students' physical well-being cannot be ignored and should be put to the exact significance (Chu & Li, 2022).

Moreover, the second-highest challenge, "poor learning atmosphere," could be related to respondents' increasing study pressure during the pandemic. This challenge was also associated with the unique situation of Hong Kong society regarding the housing conditions of university students, some of whom did not have independent bedrooms or study rooms. It was hard for some students from low-income families to secure a quiet

place to attend online classes. Many of them even needed to take classes in the bathroom to avoid the noises and interruptions from their families sharing the tight space with them.

Notably, "lack of interaction" (43.11%) was traditionally regarded as the primary challenge of online teaching and learning but only ranked seventh out of ten in this survey. The low rank of the challenge of lack of interaction could be attributed to the application of live teaching and learning platforms, on which students and instructors could have real-time communications verbally or using text messages. In addition, the low rank of "lack of interaction" as an online learning challenge can be explained by the phenomenon that students still struggled with external conditions, such as the learning environment and online technologies, which were not well prepared to support their learning. These unprepared external conditions have become extra barriers for respondents to fully devote themselves to the learning process, which would bring pressure on them.

Therefore, as an insight for online teaching practices during the pandemic, instructors and institutional administrators should clearly understand that sufficient technological and pedagogical support to the student is not only about the access and quality of learning but also about pressure relief for students by removing the mental pressure and fully engage in the online learning.

Factors Impacting Online Learning Experiences During the Pandemic

Among the five factors impacting online learning experiences during the pandemic, "stability of Internet connection" was chosen by 59.68% of respondents as a strong factor. Then "in-class interactions" (49.55%) and "after-class consultancy with instructors" (46.33%) followed as the second and third significant factors in respondents' learning experiences (see Fig. 7.3).

Among the challenges to online learning during the pandemic, around half of the respondents identified "unstable Internet connection" as a challenge, ranked the fifth among all listed challenges. However, approximately 60% of respondents thought the stable Internet connection was a crucial factor influencing their online learning experiences. Respondents' concern about the network connection or technologies could be related to their study pressure, especially at the early stage of the pandemic, when Hong Kong universities were still trying out online platforms to support
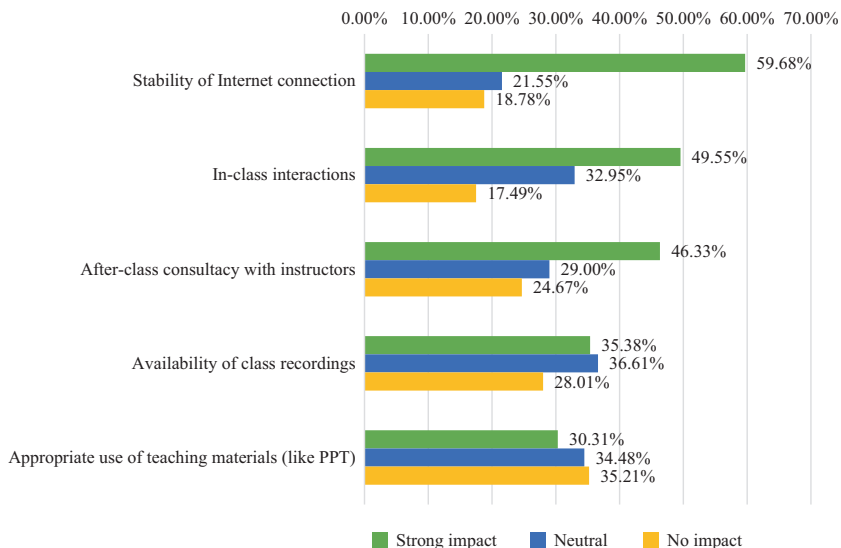
Fig. 7.3 Factors impacting respondents' online learning experiences during the pandemic

the sudden transformation from face-to-face teaching and learning to online classes.

In addition, respondents thought sufficient interactions, either in-class or after-class with peers and instructors, could strongly improve their learning experiences, even though the lack of interactions in online learning was considered a challenge by around 40% of respondents. This discrepancy in respondents' perceptions of "interactions" as a challenge and a facilitating factor demonstrated the abovementioned point that if the technical support is sufficient, respondents are eager to interact with peers and instructors to achieve satisfactory learning experiences. As an insight for online teaching practices during the pandemic, providing more interactions would be significant for students to alleviate study pressure through support from peers and instructors.

DISCUSSION

The analysis of the responses to the three survey questions related to Hong Kong university students' well-being in online learning during the COVID-19 pandemic helped answer the two research questions in this chapter. Regarding respondents' well-being challenges, it could be concluded that respondents experienced both physical and psychological well-being issues, which were eye fatigue due to long-time staring at the electronic screen and increasing study pressure due to the sudden transformation from face-to-face classes to online learning, resonating with existing literature (e.g., Cao et al., 2020; Johnson, 2022; Fan et al., 2021). Specifically, as demonstrated by the first selected question, university students in the online study needed to spend more time but found low effectiveness (Scott, 2020). Meanwhile, Hong Kong university students struggled to secure a good learning environment with sufficient technical support for online learning, which prevented them from fully engaging in online learning. As to the responses to these well-being challenges, the data derived from the third selected question reflected the significance of the stable Internet connection and adequate technical support, together with sufficient in- and after-class interactions with peers and instructors in relieving respondents' pressures. Other studies have also emphasized the environmental and technical support in dealing with online learning challenges during the pandemic (e.g., Mullen, 2021; Chandra, 2021).

Based on Hong Kong university students' online learning experiences during the pandemic, we can see higher education students do face well-being challenges in their studies (Aristovnik et al., 2020; Prasath et al., 2021). Meanwhile, literature has demonstrated that a positive mindset derived from health security and social support is critical in meeting online learning demands and overcoming difficulties (Baloran, 2020; Huang & Zhang, 2021). Therefore, we should first ensure students' physical and psychological well-being before we expect them to study online effectively and efficiently (Cao et al., 2020; Chandra, 2021; Chu & Li, 2022; Prasath et al., 2021). Students' health should come first. The focus of research on higher education teaching and learning during the COVID-19 pandemic should go beyond the instrumental perspective on effectiveness to students' well-being. Instead of only focusing on how online teaching and learning could replicate the face-to-face class regarding learning effectiveness, instructors and university administrators should prepare the students physically and psychologically for online learning. In this sense,

universities and instructors should systematically restructure course design and delivery by integrating technology and pedagogy to enhance university students' learning experiences in contingent and long-term situations (Carrillo & Flores, 2020).

It is worth noting the unique situation of Hong Kong university students' online learning conditions. As discussed above, the tight living conditions in Hong Kong have become a major challenge for university students from low-income families to take online classes. This challenge has been highlighted by the high rank of "poor learning atmosphere" in the second selected survey question. This situation has also served as a major source of Hong Kong students' mental stress during the pandemic. To deal with this issue, for example, Lingnan University, as a liberal arts institution with residential space, had carefully considered this situation and opened partial hostel rooms with strict hygiene and anti-pandemic measures for those students to have a quiet place with the high-speed Internet to take online classes. The case of Hong Kong higher education also implied that the universities and instructors should consider the inequality issues brought by the pandemic in online learning to those students with disadvantageous backgrounds. The poor living and technological conditions will bring much mental pressure on students if they are constantly exposed to these situations (Bisht et al., 2022).

Furthermore, the particular impact of the housing situation on Hong Kong university students' online learning experiences also demonstrated the heterogeneous effects of the pandemic on higher education (Aucejo et al., 2020). For example, different from Hong Kong university students in this study, some Spanish university students found that emergency online learning improved their learning efficiency (Gonzalez et al., 2020). Therefore, it is critical for educational authorities, policymakers, and institution administrators to carefully evaluate the contextual situation to make corresponding and relevant measurements in solving university students' online learning challenges and improving their well-being (Flores et al., 2021).

Conclusion and Implications

This chapter presents the well-being-related challenges Hong Kong university students faced in their online learning during the pandemic, as well as their perceptions of environmental, technical, and pedagogical support as significant solutions to these challenges. Derived from the research

results, discussions, and personal online teaching practices during the pandemic, this chapter provides the following implications aiming to improve university students' well-being in online learning during the pandemic.

At the university level, given Hong Kong university students' perception of the significance of technical and pedagogical support in the online learning experience, the institution should first provide sufficient support for students to have a comfortable environment to take online classes under conducive conditions for learning. Second, the institution should provide timely and relevant professional development programs for faculty members to prepare for emergency online teaching. In addition to the curriculum redesign for the online platform, students' physical and psychological well-being should be an essential topic in enhancing university students' learning experiences during the pandemic. At the course level, this chapter provides the following practical tips to improve students' physical well-being in online learning. First, a single session of a class should follow a strict break schedule (like every 45 minutes) to provide sufficient rest time. Second, instructors could change the background color of the PPT slides to light green, which could alleviate eye fatigue to some degree.

The limitations of this study also provide some implications for future research. First, as the survey conducted in this study did not specifically focus on university students' well-being in online learning during the pandemic, a systematic inquiry on this issue should be conducted. Second, this study was conducted in the early stage of the COVID-19 pandemic, and the situation of Hong Kong and the globe and higher education development have experienced the up-and-down. Therefore, a long-term and timely inquiry could explore the changes in university students' well-being in online learning during the pandemic.

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Innovation in Assessment of Students' Learning

CHAPTER 8

Promoting Online Authentic Continuous Assessments

*Sok Mui Lim, Eric Chern-Pin Chua, Karin Avnit,
and Peng Cheng Wang*

INTRODUCTION

Singapore Institute of Technology (SIT) prides itself as a young university of applied learning. Our applied learning pedagogy connects academic knowledge and skills with real world applications in industry and community (Lim et al., 2020). In terms of assessment practice, the university has been promoting authentic and continuous assessments, with an original weightage cap of 60% for traditional final exams.

COVID-19 accelerated the adoption of online learning and assessment. While the university successfully migrated paper-based exams online with the use of a lockdown browser and an online proctoring tool, we recognised more was needed to transform assessment practice. The pandemic triggered these further changes. First, we had to find new ways to conduct

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authentic assessments online, beyond online quizzes. Second, we reduced the final exam weightage cap to 35%, with the intention to push for more continuous and formative assessment, with earlier feedback given to students.

Transformation of assessment practice at an institutional level takes commitment and coordinated efforts across different levels (i.e., senior management, academic staff and students). This paper is written from the perspective of SIT's Teaching and Learning Centre, which reflects on the concerted effort that was taken to promote Online Authentic Continuous Assessment (OACA).

To guide us in our reflection from assessment migration to assessment transformation, we examined our practice alongside the different theories of change. Change needs to occur at different levels in a systemic and sustainable manner when an institution aims for a bold goal of transforming assessment practice. In our reflection, we will use the different theories of change to appreciate and discuss the different actions taken. Instead of describing the application of a specific change model, our aim is to apply relevant change theories to different levels of change. Change theories help identify the approach to analyse change and therefore find strategies for creating change. The change theories that we refer to in this chapter are namely cultural and social cognition theories of change (Kezar, 2014).

The cultural change theory suggests that change occurs naturally as a response to the alternation in the human environment, in other words, cultures are always changing (Kezar, 2014). Cultural theory of change emphasizes context, values and beliefs, the unconscious and the complexity of organisations. In addition to considering the context of changes caused by the pandemic, it is also important to identify the existing values and beliefs that academic staff may have about assessment practice (e.g., examination) and encourage conversations among them. Studies of resistance to change have suggested that people were often not resisting a change because they disagree with it, but rather, they did not understand its intention or how they might integrate the change into their work (Kezar, 2014). Social cognition theory of change focuses on changes occurring within the minds of individual people—their thought processes—and learning from others within a social context. Therefore, building in opportunities for reflection and feedback for individuals can help with transforming assessment practice within the university.

Literature Review: Authentic, Continuous, and Online Assessment

As a university that focuses on developing work-ready graduates, we see authentic assessment as a key element of our pedagogy. Authentic assessments are contextualised to the real world, testing learners' performance in ill-structured situations they would encounter in professional life (Wiggins, 1990). Therefore, we include a substantial work-integrated learning experience in all our undergraduate programs. We also promote authentic assessment for our classroom-based curricula. In this context, Villarroel et al. (2018) conceptualise authentic assessment along three dimensions: realism, cognitive challenge, and evaluative judgement. Realism refers to the similarity with real life and/or work, cognitive challenge alludes to the use of higher-order thinking, while evaluative judgement refers to learners' ability to self-assess and self-regulate towards mastery. Beyond preparing learners for work, authentic assessment can also be thought of as a holistic development of individuals' well-being and their contributions to society (McArthur, 2021). Currently, our university approaches authentic assessment according to the framework described by Gulikers et al. (2004), with dimensions of the task, the physical context, the social context, and the criteria and standards. Authentic tasks are activities that are also carried out in professional practice, require the integration of knowledge, skills, and attitudes, and are meaningful and relevant. The physical context reflects the way knowledge, skills and attitudes are used in professional practice. The social context resembles the social processes of the equivalent situation requirement, be it group collaboration or individual accountability. Assessment criteria and standards are transparent on the level of performance expected and the properties to be valued.

The reduction in the max weightage across different assessments has motivated SIT to rethink and redesign the continuous assessments. The spirit of a good continuous assessment is to ensure timely feedback is given to the students during their learning process (Klebs & Vazquez, 2019), to motivate them, and to help them retain the knowledge (González, 2018). This is essential so that the right guidance can be given to students to improve their learning, and performance (Osuala et al., 2018; Ramon-Muñoz, 2015). This could be further extended to the use of tech tools, such as Students Response Systems (SRS), where immediate, or 'live' feedback can be given (González, 2018), or even through the use of a predictive model (Besora et al., 2021) by sending early feedback to the

students. All of these can help increase students' motivation in their learning (Aladenusi, 2010; Hermitt, 2009). As a university, it is also imperative for SIT to manage the faculty's workload, vis-à-vis the increase in continuous assessment load for the students. It is thus critical for us to strike a balance to use continuous assessment for greater student participation, and as a way to motivate our students' learning, but not at the expense of a higher faculty workload (Jimenez-Rosado et al., 2022). Interestingly, literature has also suggested that class sizes, time limitations, and instructional content, to name a few (Oli & Olkaba, 2020), are factors that need to be considered. A fine balance to consider various factors is needed, acknowledging that feedback focuses on learning and development, whereas continuous assessments can be perceived by students as being judged, or categorized (Watling & Ginsburg, 2019). This has also driven SIT to focus on developing good assessment practices, while not taking away the intent of students' acquiring knowledge and achieving the desired learning outcome.

Managing continuous (frequent) and authentic (complex) assessments at scale, requires the support of suitable technology. Moreover, we see that remote and online learning, which was widely adopted during the pandemic, perhaps as a temporary solution to an urgent problem, is now adopted in many places, including SIT, as a significant element of the new norm of teaching and learning. In practice, remote learning often relies more heavily on self-paced learning, which on its own increases the need for continuous assessments. In the context of self-paced learning, frequent, continuous assessments act as a motivator, that keeps students engaged in the learning (Gikandi et al., 2011). Automated immediate feedback and, in advanced systems, with adaptive and personal learning paths can help with self-pacing. At the same time, online assessment help students self-assess their own progress, and help the instructors monitor students' progress remotely at scale, while reducing marking loads, where automated marking is possible. Using a diverse range of assessment formats, through the use of appropriate educational technology increases the reliability of the formative assessments and enables learners with different strengths to demonstrate competency in the taught materials (Gikandi et al., 2011; Guangul et al., 2020).

One major concern that online assessments present is that of academic misconduct in terms of dishonesty on behalf of students, either as to the identity of the student taking the assessment or the conditions under which the assessment is attempted (Gikandi et al., 2011; Guangul et al.,

2020; Khare & Lam, 2008; Tuah & Naing, 2021). Fortunately, we see that the growing need for student authentication and the ability to constrain the students to a predefined environment for the duration of the assessment, is met by significant development in the field and the technology is able to address these concerns more reliably than ever before (Guangul et al., 2020; Tuah & Naing, 2021). We see that more and more tools are introduced to the market, addressing different assessment needs, and enabling a wider range of assessment formats, with enhanced solutions to the challenges of reliability of the assessments. More recently, generative artificial intelligence (AI) tools such as ChatGPT have sparked significant academic integrity concerns in higher education, though educators do acknowledge that such tools can enhance student learning (Sullivan & McLaughlan, 2023). This challenges faculty to redesign assessments to ensure validity and integrity, considering how students might use generative AI tools.

Pedagogical Approach Adopted Through Promoting Assessment Change

Before giving specific examples of assessment change, this section aims to discuss the pedagogical approach adopted through promoting assessment change. From the literature, it is commonly known that students prefer smaller frequent assessments compared to high stake examinations, so as to monitor how they are coping at various checkpoints and to obtain earlier feedback (Harland et al., 2015). Compared to traditional final exams, inquiry-type assessments that take place over time can include feedback and acquisition of higher-order learning more easily (Harland et al., 2015). Harnessing the opportunity from the challenges posted by the pandemic, the SIT's Provost team officially changed the university's assessment policy to reduce the maximum weightage of examination. The policy change was communicated along with the encouragement to move away from a demonstration of knowledge within a short time type, or a one-occurrence type of the "traditional exam."

For transformation to take place effectively, there needs to be regular communication and support to achieve buy-in from the ground. From the cultural theory of change, change within an organisation entails the alteration of values, beliefs, myths, and rituals (Kezar, 2014). Changes in the assessment policy to limit the weightage of assessment elements can be a

push factor, but by itself does not guarantee an increase in authentic assessment. Teaching and learning regimes are defined as traditions or habits that are socially constructed which become reified structures over time (Trowler & Cooper, 2002). Regimes can also be tacit assumptions about what is and is not possible in teaching and learning (Lim & Foo, 2020). Some academic staff members have their own reservations relating to examination versus inquiry-type projects, and their views could be influenced by various considerations such as rigour, concerns about assessment of individual contribution in group projects, or time taken for marking. To challenge the teaching and learning regimes, and promote a shift to authentic assessments, we provided regular opportunities for academic staff to learn from each other and hear from the experience of their fellow colleagues. Regular dialogues on different types of authentic assessment practices (e.g., interactive orals, integrated projects, open book exams), how the assessments fit in with the selected pedagogy and opportunities to engage in critical conversations about assessment have slowly shifted the academic staff's mindset.

For change to be sustained and justified in the long run, it is necessary to incorporate the social cognition theory of change, where people are likely to change their views if they receive feedback and ongoing information (Kezar, 2014). Reflection can help this process to take place. It is important for educators to engage in critical reflection on the extent to which their intention is aligned with the actual situation (Cook & Lee, 2019). Reflection-on-action (Dewey, 1933 as cited in Farrell, 2007) refers to reflections that are retrospective and usually a part of routine practices. With reflection-on-action, the focus tends to be on problem-solving with cognitive processes engaged. In contrast, reflection-for-action (Killon & Todnew, 1991 as cited in Farrell, 2007) is a proactive approach, where the outcome of the reflective exercise provides a guide for future actions. Instead of only reporting on grade distribution at the program examination meeting, faculty are also asked to reflect and share any assessment changes, whether the assessment went according to expectation and any changes that may lead to future improvement in assessment experience (reflection-for-action). Such conversations allowed faculty within the program team to learn from each other good practices and also take note of areas to further develop students in other parts of the curriculum. The social element of change occurs as faculty realise that others are also making changes in assessment practice and learning in the process.

In summary, the following steps were implemented to promote assessment changes. First, policy change and communication of rationale. Second, regular conversations to share practices and challenge existing teaching and learning regimes. Third, promoting faculty reflection and sharing on assessment change at the program level. Both cultural and social cognition theories of change guided the implementation actions that occurred at different levels.

EXAMPLES OF ASSESSMENT CHANGE

In this section, two examples of OACA are shared. They serve as examples of changes that resulted from the assessment transformation effort that was promoted in the university.

Example One: From Traditional Test Paper to Online Oral Interactive Assessment

The first example took place within a first-year occupational therapy program. After learning from a lunchtime faculty sharing session on "interactive oral assessment," a faculty member became inspired to try it out in her module. In a first-year module named "Occupational Performance Across Lifespan," students were assessed on their knowledge of developmental milestones from infancy to middle childhood. Before the change, students were tested with a mid-semester exam paper with multiple choice answers and short written answer questions. It was observed that while students typically score well in this exam, they struggled in the later clinical fieldwork, answering parents with concerns about developmental delay.

Unlike written examinations, interactive oral questions are not rigidly standardised as students and assessors role-play using workplace scenarios, enabling students to respond to the conversational flow and achieve authenticity (Tan et al., 2021). With the change, each student was assessed online, with a standardised actor who simulated being a concerned parent, questioning his/her children's development, and seeking suggestions (Lim & Lim, 2023). The oral interactive assessment, weighted 30%, took place via zoom, simulating teleconsultation that took place during the pandemic. A total of 103 were assessed this way with two examiners. With this continuous assessment, students were each provided with individual feedback that aimed to help improve communication skills and correct errors in understanding. This feedback helps scaffold their learning

towards the final assessment in the module and clinical fieldwork in the future.

From students' feedback, more than 95% of the students reported that the interactive oral assessments have real-world relevance and enable them to gain professional skills. They liked the authentic assessment as it resembles interactions at the workplace. Interestingly, students reported that they were generally more anxious preparing for such oral assessments compared to other types of assessments (e.g. report writing or quiz). Upon reflection, the faculty acknowledged that more practice is needed to prepare students for such form of assessments in the future. Running the assessment online also meant that there was a lot more flexibility, for example, running the assessment separately in the following week for several students who recovered from COVID-19.

Example Two: From Time-Bound, Short Answer Test to Online Assignment with Dataset Provided

The second example comes from a second-year health research methods module. One competency needed for this module is statistical analysis, where learners select and justify the appropriate statistical method, carry out the analysis using statistical software, and interpret the results in the context of the research question. The faculty wanted students to not just learn statistical knowledge, but to acquire the competency to carry out the analysis in future real research projects. The initial assessment was a time-bound, open book, practical examination in short answer to the question format. While it had elements of authenticity, on reflection the questions were overly structured and the time bound was somewhat artificial.

With the promotion of assessment change, the faculty then changed the assessment to an online assignment administered via the University's learning management system. Students were given a dataset and the flexibility to choose their own research questions. They were then required to carry out the data analysis and submit a partial manuscript describing their research question, their statistical reasoning (the sample results and statistical testing of population parameters), and the answer to the research question based on the analysis. Having the assessment as an online assignment, therefore, enabled higher authenticity to what a research assistant would do. In the real world, a staff member who performs research will need to plan and manage his/her time towards the deadline (beyond a

limit of 2 hours exam), take ownership of his/her work to suggest research questions, conduct analysis, and check for accuracy.

Students were also given group feedback highlighting the common gaps and misconceptions to take note of when undertaking their honours thesis in their third and final year. From the student's perspective, some felt that the assessment (and associated learning leading up to the assessment) helped make them feel more prepared for their honours thesis project. Some though were uncomfortable with the assignment nature and preferred more specific instructions. From the faculty's perspective, the change brought the assessment closer to authenticity and more performance-based. The manuscript format also allowed faculty to better see the student's reasoning process.

Discussion

While the transformation of assessment practice takes time, it is important to reflect on and monitor the trends and signs of what is happening. This is done through several methods, such as reviewing assessment changes, insights from faculty's reflections presented at examination meetings, and most importantly, ongoing candid conversations with academic staff and students.

Harland et al. (2015) presented both faculty and students' views on having multiple assessments throughout the semester that replaced high stake examinations. Interestingly, they described students' "love-hate relationship" with assessment and grading (Harland et al., 2015, p. 535). While students prefer low stake continuous assessments to high stake examinations, with the next assignment always imminent, students expressed being irritated and stressed by frequent grading and having no time to think outside of assessment. While we promote moving away from high-weightage final examinations, it is important to ensure that the continuous assessments are meaningful and manageable in terms of workload. Suggestions were made by Harland et al. (2015) to consider fewer but more integrated inquiry-type assessments, which will require much more institutional commitment to coordinate integration across modules with the aim of higher-order learning outcomes. In our ongoing journey of improving assessment design, we may need to look more into integrated inquiry-type of assessments.

With the ongoing sharing of successful attempts at authentic assessments, we are beginning to witness a wider adoption. An example of an

adopted authentic assessment is the increase in the use of interactive oral assessments, simulating authentic scenarios where assessors engage students in "genuine and unscripted interactions" that are representative of what would be encountered in the workplace (Tan et al., 2021). Assessors may either be in a role (e.g., supervisor) communicating with the student/s or they may be observing students communicating with others (e.g., standardised patients). Since the initial effort to promote such assessments, there are now 11 modules implementing interactive orals involving academic staff across five disciplines/divisions. With the support of an educational developer, several academic staff across different divisions got together to examine the benefits and outcomes of such assessment and jointly published an article (see Tan et al., 2021). The ongoing effort to design authentic assessments can benefit students in preparing them to be work-ready. It is important to consider both authentic assessments that can be conducted in face-to-face situations or online, with technology that allows for scalability and flexibility.

The migration of examinations online during the pandemic has also exposed academic staff to the ways technology can effectively improve assessment. Many experienced for the first time the different types of questions that can be tested within the online system and how efficient the automated gradings were. The experience also increased staff's confidence in managing online assessments and in many cases allowed them to go beyond online exams and quizzes to adopt new tools that enable the design of more authentic online assessments. This includes the use of online discussion boards to assess participation, the use of e-portfolios to enable students to demonstrate work in a variety of formats and simulated, virtual and remote labs. The wide range of available tools and the affordability of the development of bespoke solutions enable academic staff to design OACAs to be both valid and reliable, improving students' engagement with the taught content, and measuring the achievement of learning outcomes appropriately.

The use of online tools to administer assessments also allowed us to improve marking practices with more consistent marking at the individual level as well as the team level, reduced calculation mistakes, shorter marking time and administration load that is associated with the management of paper-based scripts. And of course, the move from paper-based exams to online assessments allowed us to significantly reduce the use of printing and paper, which promotes environmental sustainability. From the perspective of student learning, authentic assessments are perceived to be

more meaningful and to promote a deeper learning approach, while the use of technology increases flexibility and convenience and, in some cases, is on its own an element of authenticity in its resemblance to current industry practices.

Anecdotally, there have been positive experiences that resulted from sharing reflections at the program examination meeting. There are now more conversations about assessment designs among academic staff to reflect on the quality of assessments and the students' experience. To ensure that such reflection remains meaningful over a long period of time, it is important that the chair of the meeting raises pertinent and focused questions with the aim to drive an open culture of continuous improvement in assessment practice. This draws on the cultural theory of change. As a critical discussion about teaching and learning practices may evoke negative responses from colleagues, academic staff tend to avoid conflict with colleagues, to minimise the risk of making professional enemies, by not opposing or being critical of colleagues' views (Becher & Trowler, 2001). This can be even more prevalent in the Asian context where people tend to reserve their critique or concerns and not raise them openly (Lim & Foo, 2020). Presenting self-reflection on assessment opens a window of opportunity for constructive feedback from colleagues but this can only happen if there is an open and supportive culture. Applying the social cognition theory of change (Kezar, 2014), people are more likely to change their views if they receive feedback and ongoing information, and in this case, it was about learning from other faculty's assessment practices and receiving feedback and suggestions about their assessments.

Conclusion and Recommendations

The onset of the COVID-19 pandemic pushed educators out of the comfort of tried and tested practices. In the first stage, due to the pressures of the pandemic, most resorted to migrating their existing practices to new platforms. Subsequently, however, the effort for assessment transformation, guided by thoughtful leadership and regular conversations, opened a window of opportunities to ride on the momentum of change and the exposure to new tools. This inspired educators to transform their assessments and to consider what else is now possible. One important implication of the change in the assessment policy and the push to more authentic assessment practices is an increased alignment between module learning outcomes and the assessments that measure them. Unlike the translation

of paper-based exams to online quizzes that took place due to the sudden move to remote learning, the adoption of more authentic forms of assessments enables for a wide range of assessment tasks that are similar in nature and in setting to the industry practices, thereby increasing the validity of the assessments.

As pointed out earlier in the literature (e.g., Oli & Olkaba, 2020; Watling & Ginsburg, 2019), an effort is also needed to ensure a good balance is maintained between the assessment load for students and faculty load in marking and providing timely feedback. The design of the continuous assessments is thus crucial to achieve this balance. The transition, as pointed out, is progressive. Collectively, SIT will need to 'normalize' this change, where deliberate collaborative efforts are necessary for both the academic staff and the management to make this change beneficial to our student's learning. In the future, SIT can work on getting feedback from both academic staff and students on their experience with the assessment changes. This will help to further identify resources that may be needed, such as providing time or better technology for implementing new authentic assessment tasks. In addition, encouraging faculty to gather feedback from students specifically on assessments and considering students' voice to improve assessment tasks can be helpful.

There are several other recommendations for educators to consider. Firstly, to design authentic assessments in alignment with the current industry practices, educators need to be familiar with what is happening in the industry. Frequent communication with practitioners in the industry is crucial, for example, regarding how certain skills are applied at work or what industry supervisors expect for an entry-level job function. Such knowledge enables educators to design new authentic assessments or refine current ones towards increased authenticity. Next, if there is an institutional effort to move towards continuous assessments, communication with other educators who are teaching the same cohort of students in the same semester about deadlines and assessment designs is vital. This allows the teaching team to spread the assessment load, and avoid several assessments of the same format (e.g., video or blog) due within the same timeframe. Finally, when a new technology is required in an assessment, it is highly recommended that educators commit time to familiarise students with the technology. It is crucial that students are assessed related to the learning outcomes, versus being penalised due to difficulties in using a new technology.

A well-designed online, authentic, continuous assessment can bring joy in teaching and learning, both to educators and students respectively. While students can experience more meaning in completing the assessment, educators may feel an increased sense of satisfaction. Transformation of assessment practices does take commitment, coordination, and time. These efforts would be worthwhile if students' learning can truly be enhanced.

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CHAPTER 9

Assessment and Teaching of Twenty-First-Century Skills for Students of Engineering

Mekala Sethuraman, Sangeetha Thenmurugakani,
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INTRODUCTION

Online education is a distinguished outcome of the technology-driven twenty-first-century society, especially the post-COVID era. The emerging technologies and digital tools have had an overarching impact on higher education, especially in language learning. Presently, language teachers could provide students with unique opportunities and personalized learning experiences beyond the physical classroom space with the

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help of the digital tools. Nevertheless, technology is a double-edged sword, and the teachers recognize and tackle a number of limitations in maneuvering the online platforms. Especially in online language education, the teachers are expected to manage the constraints effectively and impart the skills set to the students. But the sudden shift to online education due to the pandemic did not provide adequate time for the language teachers to be acquainted with handling the digital tools and integrating technology into twenty-first-century skills education. Moreover, a skills gap has been identified between the demands of the industry and the employability skills of the engineering students. This gap could be addressed by training the tenets of twenty-first-century skills set to the language teacher-trainers using ICT tools, and the teachers in turn would educate the student beneficiaries. In consonance, the present chapter aims to equip the language teachers with the tasks and assessment criteria of twenty-first-century skills to implement in online English classrooms with specific reference to the Assessment and Teaching of 21st Century Skills (ATC21S) framework.

The significance of twenty-first-century skills and ATC21S is discussed in this section. Twenty-first-century skills encompass the skills and competencies that a person has to possess to thrive in today's world. The twenty-first-century workplace is rapidly changing due to advancements in science and technology. In addition to the job of an engineer becoming more challenging, there exists a substantial skills gap between the skills that engineering students acquire in college and the employers' expectations (Morell, 2010). The content-heavy, traditional engineering curriculum will not suffice to prepare engineering students to be workplace-ready. They need twenty-first-century skills in addition to their subject knowledge to meet the expectations of employers (Ramanan et al., 2015). The engineering curriculum needs to accommodate twenty-first-century skills without diluting its core domain knowledge. However, developing and assessing twenty-first-century skills and language skills is a challenging endeavor, especially in the more technology-oriented classrooms following the COVID-19 pandemic. Hence, the authors of the chapter propose the ATC21S framework for effective implementation and assessment of twenty-first-century skills in online teaching platforms.

The ATC21S framework's model of twenty-first-century skills is also styled as the KSAVE model, where KSAVE stands for "knowledge, skills, attitudes, values and ethics" (Griffin & Care, 2015, p. 7). As cited in Griffin and Care (2015), Binkley et al. (2012) categorize the skills into
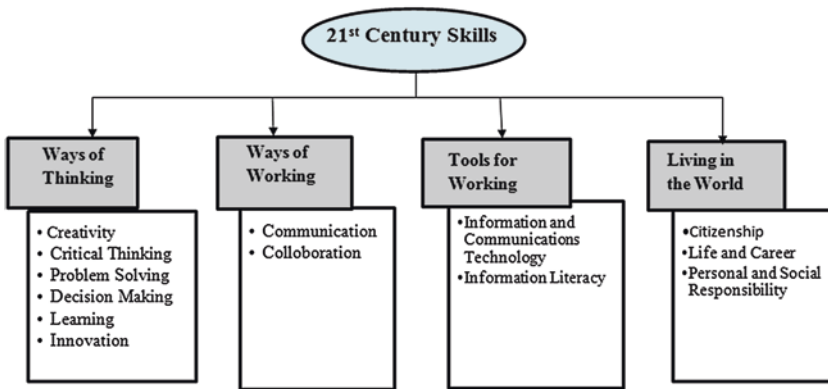
Fig. 9.1 Classification of twenty-first-century skills

four broad categories, as showcased in Fig. 9.1. The four categories are Ways of Thinking, Ways of Working, Tools for Working, and Living in the World. Ways of Thinking emphasizes higher order thinking skills. It includes skills like creativity, innovation, critical thinking, and metacognition. Ways for Working represents globalization and includes communication and collaboration skills. Tools for Working represents the skills set of information literacy and ICT literacy necessary in this digital world. Living in the World includes twenty-first-century skills like local and global citizenship, life and career, and personal and social responsibility.

Abdulwahed et al. (2013) have formulated a four-dimensional twenty-first-century engineering skills model: (1) core knowledge and practice, (2) cognition, mental, and thinking, (3) professional and interpersonal, and (4) business and management, analyzing over 200 studies across various nations integrating twenty-first-century skills with engineering skills and knowledge. According to Abdulwahed et al. (2013), the most critical twenty-first-century engineering skills, in terms of employability, generic skills, and graduate attributes are communication skills, information and communication technology (ICT) skills, problem solving skills, teamwork (Collaboration) skills, and business and management skills. Of these skills, communication, ICT, problem solving, and collaboration are defined and categorized in the ATC21S framework. Therefore, this chapter focuses on the following skills:

1. Problem solving skills
2. Information and communication technology skills
3. Communication skills
4. Collaboration skills

There are many conceptual frameworks of twenty-first-century skills, for example, the Partnership for 21st Century Skills (P21), the EnGauge framework by the Metiri Group and North Central Regional Educational Laboratory (NCREL), the Programme for International Student Assessment (PISA) by the Organization for Economic Cooperation and Development (OECD), and the Assessment and Teaching of 21st Century Skills (ATC21S). This chapter primarily addresses the assessment tasks proposed by the ATC21S framework with reference to the above-mentioned four critical twenty-first-century skills and how such tasks could be integrated into the English classroom of engineering students. This is not only because the assessment tasks of the ATC21S framework are computer-based and so more suitable for online learning and teaching but also because these tasks are more oriented towards assessment for learning than assessment of learning. Further, the framework enables "teachers to adapt the tasks to local context" (Griffin & Care, 2015, p. 16). Eventually, the ATC21S tasks could be adapted in both the online and offline context of Asian higher education. This chapter demonstrates how the tasks based on ATC21S could be integrated in the English class-room to enhance and assess the twenty-first-century skills and English language skills of engineering students of India. Moreover, the prime objective of the chapter is to provide insights on effectively imparting and assessing the requisite twenty-first-century skills for the engineering students in online teaching platforms. This not only helps to improve the employability of the student by bridging the skills gap between engineering students and employers but also to improve the standard of Indian engineering education.

LITERATURE REVIEW: ASSESSMENT AND TEACHING OF TWENTY-FIRST-CENTURY SKILLS

Skills Gap

The skills gap between the employers' expectations and engineering students' perceptions of their technical and non-technical skills has been explored all over the world. Ramadi et al. (2015) have explored the skills

gap in the Middle East and North Africa, and their findings have demonstrated a significant gap between the expectation and satisfaction of the industry members in all the 36 skills that they have listed as essential for engineering students which include communication and continuous learning. In Malaysia, Zaharim et al. (2009) have explored the skills gap and identified that 'communication' and 'problem solving' are the most critical attributes expected from engineering students by employers. Male et al. (2010) have organized a large-scale survey in Australia studying the skills gap and have highlighted six deficiencies which include communication, problem solving, and teamwork. Loyalka et al. (2014) have examined the caliber of engineering pedagogy in the BRIC countries—Brazil, Russia, India, and China. According to the study, these countries have an adequate number of engineering graduates to more than satisfy the industrial requirements, but the graduates' skill sets do not meet the requirements of the employers. Moreover, the study also shows, "India seems least equipped to improve the quality of engineering education on a broad scale" and "India's elite programs appear to lag the furthest behind" among the BRIC countries in factors like "qualified faculty" and "research productivity." The ATC21S project has also identified the skills gap and the need to foster the twenty-first-century skills of the students to bridge this gap. Ramadi et al. (2015) have recommended that educational institutions could augment the skill sets by revising and improving the engineering curriculum. Similarly, Morell (2010) suggests five principal actions to reduce this gap: innovate and reform the engineering curriculum, focus on learning, cultivate creativity and ingenuity, promote continuous assessment, and educate the future engineering professor. Morell and DeBoer (2010, as cited in Samavedham & Ragupathi, 2014) have observed that the literature on engineering education tends to emphasize the need for changes in the engineering curriculum but does not provide guidelines, best practices, and roadmaps for the teachers. There are many such calls for changes and updates to the engineering curriculum. At the same time, there is confusion on what changes should be made and how these changes should be implemented. As a consequence, this chapter recommends and illustrates how to effectively integrate the assessment tasks based on the ATC21S framework in the online classroom of engineering students to bridge this skills gap without diluting the core of the engineering curriculum.

Teaching of Twenty-First-Century Skills

In the field of engineering, Mourtos (2015) has focused on process skills (skills that "involve a process one needs to follow to accomplish a certain outcome"), which include problem solving, communication, and collaboration. The author has proposed a course design process that develops these skills and aids in preparing the engineering college students for the demands and requirements of the twenty-first-century working conditions. Samavedham and Ragupathi (2014) have acknowledged the necessity to incorporate twenty-first-century skills in the engineering curriculum of Singapore. They advocate a flexible and innovative curriculum with a strong emphasis on problem-based learning and provide clear course learning objectives. Frache et al. (2019) have considered the crucial pedagogical approaches that assist the progress and proficiency of twenty-first-century skills at higher educational institutes across the UAE, focusing on engineering education. The proposed model, known as PDRA, aims to strengthen the caliber and efficacy of vocational learning. Its four essential features include present, do, reflect, and apply.

Teaching in EFL and ESL Context

In terms of integrating twenty-first-century skills and language learning, Fandiño (2013) has enlightened and encouraged the EFL teachers in Columbia to incorporate tasks that allow their students to learn not only English but also twenty-first-century skills. Halvorsen (2018) has discussed how the 4Cs of twenty-first-century skills—communication, collaboration, critical thinking, and creativity—can and should change the world and impact English language teaching and learning worldwide. Rafiq and Hashim (2018) have summed up that augmented reality game (ARG) could increase twenty-first-century skills like collaboration, communication, critical thinking, and problem solving, and simultaneously improve students' mastery of the English language skills. Fakhretdinova et al. (2020) have discussed the twenty-first-century skills in foreign language teaching in the context of higher education and have suggested some effective methods to integrate those skills in the language classroom. Activities like oral quizzes, PowerPoint presentations, and letter and e-mail writing tasks would foster communication; group discussions and mock interviews could be conducted to encourage collaboration; tasks involving real-life situations, ethical issues, and problem solving could develop

critical thinking; creativity could be improved through tasks requiring original designs, alternative solutions, and innovative ideas.

Mekala et al. (2020) have examined the level of twenty-first-century skills possessed by engineering students in India and have discovered the inadequacy in the students' skills set. The authors have further recommended developing a module that integrates the twenty-first-century skills in the engineering curriculum as a part of the English syllabus. Wadhwa et al. (2016) have explored the use of technology to foster students' involvement in the process of learning to inculcate twenty-first-century skills in the English classroom of engineering students in India. They realized that using mobile applications in a student-centered approach to learning would improve the students' motivation, engagement, and performance. Moreover, the COVID-19 pandemic has accelerated the integration and use of online platforms and digital tools in language learning. As a result, it necessitates the implementation of twenty-first-century skills through online platforms.

Sahin and Han (2020) have revealed that teachers in Turkey possess positive opinions on incorporating twenty-first-century skills and technological tools into EFL classrooms. In addition, Behforouz et al. (2021) have revealed that Omani EFL learners are motivated to exchange learning and teaching materials through online platforms and have found it helpful to improve their skills and knowledge. Further, they have identified online learning to be more interesting than the traditional method and are willing to continue using online platforms for the learning process. Hazaymeh (2021) has revealed that students of UAE have a positive attitude towards online distance learning as it empowers them to develop twenty-first-century skills, including communication, collaboration, and problem solving. Moreover, the majority of the respondents have an acquired language proficiency successfully through online distance learning. Nevertheless, there have been a few drawbacks, such as technical problems, poor or slow internet connections, and no physical interactions, which may lead to social isolation and demotivation in students. According to Özışık (2021), the university students of Turkey have a very weak perception of the online classroom environment to motivate them in an ELT classroom, as the students face technical problems such as poor internet connection and background noises at home while attending online classes.

Kramer (2021) has investigated the language teachers' experiences in an American University during the transformational phase of education from face-to-face teaching to online teaching during the COVID-19

pandemic using a mixed-method study. In terms of challenges, the teachers have been concerned about adapting to technology, improving student–teacher interaction, allocating sufficient time, and encouraging student participation. Regarding opportunities, the teachers have discussed ways to create a sense of community in the online classroom and effectively communicate with the students even though they are not physically present. As a result, it is evident from the literature that though there are both pros and cons to online teaching and learning, the teacher could transform the experience into a productive one with the help of effective tasks and tools.

Assessment of Twenty-First-Century Skills

Assessing skills is a challenging and complicated task. Moreover, a major reason for the gap in twenty-first-century skills apart from the curricular issues is that high-stakes tests do not assess these skills. Therefore, the assessment framework should also be facilitated to assess these skills. Asri (2019) suggests that assessments should be updated to reflect the demands and needs of the twenty-first century and also suggests tasks like structured interviews and role-plays to assess the twenty-first-century skills of school students in the EFL context. According to Care and Kim (2018), most of the twenty-first-century skills are demonstrated through actions. Moreover, the main objective of twenty-first-century skills education is to develop the students' capacity to generalize, adapt, and apply the skills across different contexts. Formative assessment is more suitable for this concept than summative assessment. This is because formative assessment provides ongoing feedback on the progress of the skills development to both the teachers and the students. Moreover, in engineering education, the students gradually comprehend the concepts and theories over time. Hence, assessment should also be conducted continuously and regularly over time.

Assessment tasks that enable rote study and memorization should be eliminated. Instead of measuring the students' ability to recapitulate knowledge and answer conventional and typical questions, the tasks ought to focus more on measuring how the students are able to utilize their acquired knowledge and skills in pragmatic and realistic conditions. Also, open-ended assessment formats like performance assessments, portfolios, and open-ended quizzes could induce creativity and facilitate the students to ponder and reflect on the curriculum (Nieveen & Plomp, 2018).

During online lectures, the teacher could ask students' perspectives on the task and assess the comprehension of the lesson taught in the classroom through polls and online quizzes (e.g., HubSpot, Playbuzz, Mentimeter). The polling feature is available on platforms like Zoom, MS Teams, and Webex. Polls could also be conducted externally using tools like Kahoot, Quizizz, and Quizlet. Hot Potatoes is another program that enables the teachers to create customized cloze-tests, crossword puzzles, and so on for online classes. It could be simple closed questions or open questions.

Webb et al. (2018) suggest using IT-enabled techniques combined with traditional methods of assessment to address the challenges in the assessment of twenty-first-century skills. The technological advancements have also increased the possibilities of longitudinal studies on students' performance over time. For instance, digital portfolios could be used to document the progress of students' performance throughout their time in college. Wadhwa et al. (2016) have proposed that self-assessment, peer-assessment, and assessment by mentors performed at regular intervals using smartphones and mobile applications are the best way to inculcate and continuously assess the twenty-first-century skills of engineering students. A positive element in online learning and teaching is the ease with which one can record the students' performance and make it available to them. The recording feature is available on all the prominent online platforms, such as Microsoft Teams, Cisco Webex, Zoom, and Google Meet. By reviewing their performance, the students could self-assess the mistakes they make and work on them.

Samavedham and Ragupathi (2014) discuss different forms of assessment and teaching methods. They explain how assessment practices may be re-envisioned to help the students develop their twenty-first-century skills. They recommend assessment tasks involving more group work and at the same time ensuring individual accountability. Also, the assessments should be extrapolative and involve analysis, synthesis, and evaluation. Abdulwahed and Hasna (2017) show that engineering design competitions (EDCs) positively impact twenty-first-century skills necessary for engineering students. This is found to be true for students from Asia, the Middle East, and the EU. More importantly, it is consistent across genders as well. Thus, tasks promoting twenty-first-century skills could also be implemented effectively in a competitive spirit.

In online education, Lee et al. (2020, as cited in Özışık, 2021) have pointed out that teachers can share students' progress in online exams through e-mail as this would help students to organize their learning

process and increase their self-awareness. Sharing the results through e-mail could help both teachers and students keep track of their individual progress throughout the entire course. It is also accessible to the students at all times. Also, the teachers could provide more personalized feedback in this way rather than the essential feedback common to all the students in the class. It could also sometimes lead to productive discussions between the teacher and the students who may feel inhibited from initiating such discussions in front of their classmates. The chances of plagiarism also seem to increase with regard to online assessments. At the same time, the chances of identifying plagiarism are also more in online assessments because it is easier to check for plagiarism with the help of plagiarism software like Turnitin and Urkund in computer-based tasks than in paper-pencil tasks. Another interesting factor in online assessment is the presence of typographical errors. Students tend to make typographical errors when they type the answers fast, especially when there is a time constraint. The students tend to become lackadaisical in this aspect, mainly because Word Processing Software like Microsoft Word usually makes the user aware of such mistakes. However, this is not the case at all times. The teachers should reiterate the importance of proofreading to the students to prevent such mistakes.

The authenticity of assessment plays a paramount role in online teaching. The National Research Council et al. (2001) have identified three fundamental components of assessments: "a model of how students represent knowledge and develop competence in the subject domain, tasks or situations that allow one to observe students' performance, and an interpretation method for drawing inferences from the performance evidence thus obtained" (p. 2). In this line, rubrics are highly effective for assessing and grading non-technical skills like communication and teamwork, as well as technical skills like problem solving (Mourtos, 2015). A rubric is a tool for evaluation that contains criteria and performance descriptions that guide the teachers to assess and rate the students' work. It typically provides a clear and precise description of the assessment criteria and a fair and valid scoring scale that assists the teachers in assigning grades to students' work without bias. A rubric could also help both the students and teachers to be aware of the expectations. It also helps them to identify the strengths and weaknesses of the students in a particular task. In online education, the rubric has also evolved to encapsulate factors specific to it. For example, for an online speaking task, the rubric would also tend to include criteria like whether the students have ensured good network connectivity

during the task, whether they have switched their video on, and whether they have maintained the etiquettes of an online meeting like switching their mic off when they are not speaking, not interrupting when someone else is speaking, 'raising their hand' and waiting for their turn, and so on.

Binkley et al. (2012) have proposed that the twenty-first-century skills assessment must (a) align with developing the twenty-first-century goals, (b) adapt to the latest development, (c) be primarily based on performance, (d) benefit teachers, students, and administrators by giving authentic data, and (e) meet the standards for an adequate assessment (like being fair, technically sound, and valid). Moreover, an assessment should not be limited to collecting data on the students' knowledge, skills, and competencies but also extend towards enhancing the skills and competencies. In other words, the tasks should be assessments for learning and not assessments of learning. Furthermore, an assessment should become a part of the teaching and learning process—a learning event. In concord with this, this chapter proposes to adapt and integrate the computer-based assessment tasks of the ATC21S framework in the online English classroom of engineering students to teach and assess the four requisite twenty-first-century skills. The ATC21S project was created and funded by the three technology giants—Cisco, Intel, and Microsoft—in 2008. The six countries that have participated in the project are Australia, Singapore, the USA, Costa Rica, Netherlands, and Finland (Griffin & Care, 2015). The conceptual basis for the ATC21S project has been established by Griffin et al. (2012) in their edited collection of white papers. Griffin and Care (2015) have discussed the methodologies for developing and implementing the ATC21S project in the six participating countries. Care et al. (2018) have explored the issues surrounding the ATC21S in this technological era and dynamic educational setting. These studies by ATC21S have focused primarily on school students and have been mostly successful.

It is clear from the literature that twenty-first-century skills education is vital for the students of engineering to satisfy the requirements of the twenty-first-century workplace. Nevertheless, it is evident that only scant research is available on integrating and assessing twenty-first-century skills and English language learning in engineering education. In this line, this chapter focuses on how the tasks based on the ATC21S framework could be used in the online English classroom of Indian engineering students to develop and assess the four most important twenty-first-century skills.

Pedagogical Approach Adopted in Assessment and Teaching of Twenty-First-Century Skills

The twenty-first-century skills set could be integrated in the English classroom of the engineering students judiciously in the manner that the students could develop their twenty-first-century skills set as well as their language proficiency. In an online classroom, the tasks based on the ATC21S framework can be adapted effectively with the help of online platforms like MS Teams and diverse digital tools like Google Docs, Kialo, Kahoot, and Hot Potatoes. This section delineates the pedagogical approach of how to administer the tasks and activities to develop and assess the four twenty-first-century skills in an online English classroom of engineering students. This section also includes the assessment criteria for the four twenty-first-century skills to evaluate the performance of the students.

1. **Problem Solving Skills:** ATC21S analyses problem solving skills under 'Collaborative Problem Solving' tasks. It describes 11 tasks that fall under 2 categories, namely content-free tasks and content-dependent tasks. The content-free tasks do not require any prior specific knowledge to complete the tasks. In contrast, the content-dependent tasks are related to the science and mathematics curriculum, and prior knowledge could help to complete the tasks.

   The content-free tasks would be more appropriate to incorporate in the English classroom as they are based on a hypothetico-deductive approach. The four content-free tasks proposed by ATC21S are Hot Chocolate Task, Olive Oil Task, Sunflower Task, and Laughing Clowns Task. These tasks (elaborated on Griffin et al., 2015) are discussed as follows:

   (a) **Hot Chocolate Task**: The participant has to maximize the sales and profits with the help of the recipe and market information across the given regions.

   (b) **Olive Oil Task**: The participant has to fill a jar with 4 liters of olive oil when only 5 liter and 3 liter jars are available and when another participant controls each jar.

   (c) **Sunflower Task**: The participant has to mix two plant foods and achieve the ideal amount required to maximize the plant's height.

(d) **Laughing Clowns Task**: The participants have to identify the pattern of the function of their clown machine, compare it with the other participants' clown machine, and determine whether their clown machines work in the same way with the help of 12 balls shared between them.

Krkovic et al. (2018) propose Lohhausen as a typical illustration of a realistic problem solving system. This scenario impersonates a functional fictional village. The participant acts as the mayor of this village. The goal is to make the community have a content living situation. Moreover, it is also semantically rich and simulates the complexity of the real world. This task could easily be used in the English classroom of Indian engineering students. The students could be asked to envision themselves as the mayor of a city and describe how they will improve the community. In the online class, the teacher should describe the scenario of the problem in the village/city to the students in detail. The students are expected to identify the source of the problem and then provide the solution to the problem.

Another assessment task that could also be easily adapted is the 'Holiday' task seen in Fig. 9.2. It is a static paper-pencil task used in the PISA 2003 cycle to assess problem solving. The participant is provided with a
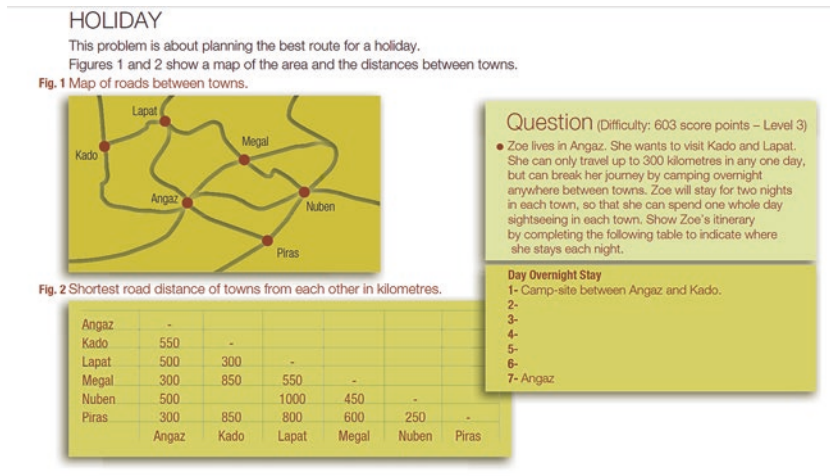

Fig. 9.2 Holiday Task in PISA 2003 (Krkovic et al., 2018)

map containing six towns and a table giving the shortest road distances of those cities from each other in kilometers. The participant has to plan the optimum route under specific constraints.

In Fig. 9.2, Zoe lives in Angaz and wants to visit Kado and Lapat. The constraints are that she could travel only up to 300 km in a day; she can camp overnight anywhere between towns; she can stay in a town for two nights and spend a whole day sightseeing. The student has to prepare an itinerary by showing where she would stay every night for a week.

When adapting this task to the local context, the names of the cities/ towns could be changed to ones familiar to the students and local to the region. This will aid the students in clearly comprehending the problem and also in better planning the trip. The students are encouraged to think about all the possible routes and then choose the optimum route. They are given time to collect data like accommodation and places to see. Finally, they are expected to explain why their chosen route is the optimum route with its pros and cons. It is important that the chosen optimum route is logical as well as practical and could be implemented. Thus, the students are taught that there would be many possible solutions to a problem and that the pros and cons of all these solutions should be analyzed before landing on the best solution suited to their needs and applicable under the constraints. Thus, the criteria for the assessment of problem solving skills comprise the comprehension of the problem, the definition of the problem, the plan of action, the collection and analysis of data, the interpretation of the results, the solution to the problem, and the implementation of the solution.

In terms of language skills, the students' logical organization and clarity in presenting the solution, coherence, the use of appropriate discourse marks while comparing and contrasting the solutions, and use of appropriate diction while presenting the argument and persuading the reader/ audience are some of the major criteria to be assessed in these tasks.

It is crucial to notice that both these tasks could be oral or written in terms of English language learning. If administered as an oral task in an online class, Fig. 9.2 could be displayed on the online teaching platform, and the teachers could ask the students to voice out their answers. In the case of a written task, Google Forms could be used. Google Classroom and MS Teams could also be used to administer this task as an assignment. The students can also be asked to turn in their assignments in Turnitin or through e-mail. In addition, the teachers can employ tools like 'Write & Improve,' and 'Inside Writing' to engage the students to write.

2. **Information and Communication Technology Skills**: ATC21S discusses ICT under 'Learning in Digital Networks." The different levels of performance (Care & Kim, 2018) include the ability to
   - Use basic tools.
   - Use complex applications pertinent to learning and teaching.
   - Develop evaluative skills as knowledge and experience increase.
   - Manage and create new approaches.

ATC21S has developed three scenarios for Learning in Digital Networks. These scenarios could serve as a model and could be administered as improvised activities in an online English classroom. The scenarios specified in Wilson and Scalise (2015) are demonstrated as follows:

(a) **Arctic Trek:** This module is based on the Go North/Polar Husky information website (www.polarhusky.com). This website is an online adventure learning project based around arctic environmental expeditions. In this task, the participants are grouped into small teams and then they tour the "scientific and mathematics expeditions of actual scientists" (Wilson & Scalise, 2015, p. 64) online. The participants are asked to ponder the various tools and approaches to unravel clues during the virtual tour. This task helps teachers to integrate technology across different subjects.

(b) **Webspiration:** The students are asked to create an idea map after analyzing the given poem using the Webspiration tool. This could be done as a collaborative task as well, as the students could submit their own ideas and also build on other students' ideas. This helps the students to be more actively involved in analyzing the poem rather than the traditional lecture method. The concept of Webspiration could be adopted in various online platforms like Microsoft Teams and Zoom. The teacher can first share the poem to be analyzed with the students. This could be done prior to the class via e-mail or during the class via the chat option. Then, the teacher invites the students to put forth their ideas in the chatbox. In terms of ICT, this task only necessitates basic skills like downloading and retrieving the file sent and managing a conversation in the chatbox. In terms of language development, using the chatbox could prompt the introverted students to participate in the discussion as they may prefer to type in the chatbox rather than speak

out. Similarly, the teacher could also divide the students into smaller groups with the help of breakout rooms. This feature also helps to reduce the anxiety of introverted students and encourage them to express their opinion.

(c) **Second Language Chat**: This is a peer-based second language learning environment where the students could interact. The students have to invite participants and facilitate a chat in their mother tongue and second language. It also involves the use of other online tools such as spreadsheets. Nevertheless, this task has been discontinued as it has been identified to be "a forward-looking, intriguing scenario, but farther away on the adoption curve for school-based technology" (Wilson & Scalise, 2015, p. 76).

International Computer and Information Literacy Study (ICILS) is a response to the increasing use of ICT in modern society conducted by the International Association for the Evaluation of Educational Achievement (IEA). Its various tasks include answering MCQs and short-response questions, performing skills-based tasks, using a broad array of tools like word processors and presentation software, and navigating web content to acquire requisite information. Each module includes a collection of five to eight minor tasks. These minor tasks usually take a minute each to complete. These tasks also help develop the contextual knowledge required for the major task. The single major task usually takes about 15–20 minutes to complete. The major task would usually be creating a poster, presentation, social media post, or web page. The product developed would require the knowledge and resources the participants were acquainted with during the minor tasks.

In the same vein, in the online English classroom of the Indian engineering colleges, the students could be asked to create a website for the college using free and simple applications like Google Sites, design and create content for a magazine cover page using free online templates, or make a PowerPoint presentation on a topic. These tasks could also be divided into minor tasks and then a major task. For example, the students could be asked to write a paragraph about their college, collect pictures of their college, and so on, and then finally be asked to create a website for the college. In these tasks, the students are expected to use complex applications and more advanced ICT skills like editing pictures, using appropriate font style and color, perfecting the alignment of images and text, and creating innovative and dynamic designs. Thus, the criteria for the

assessment of ICT Skills consists of the students' use of appropriate applications, mastery of the tools and resources, creativity, originality, and aesthetic factor. The content or write-up in the product is the main focus in terms of language proficiency. The factors like appropriate diction, correct spelling, and proper use of punctuation and capitalization are focused on and assessed in these tasks.

3. **Communication Skills:** Communication could be formal or informal, depending upon the circumstances. For instance, it is formal when information is presented to the management and customers and informal in an e-mail exchange between team members. It could also be oral or written. Whatever be the form or circumstances, it is crucial to use correct language and terminology. Unlike problem solving and ICT skills, communication skills have always been a part of English language learning and teaching.

   Written Communication: The students of engineering should be able to (adapted from Mourtos, 2015)
   - Produce reports that are well organized, following the guidelines of the institute/company.
   - Describe engineering experiments, projects, and solutions clearly and coherently.
   - Describe the procedures and results accurately, precisely, and briefly (like abstracts and summaries).
   - Use graphs and tables to present results following the publishing standards.

The tasks would be more effective in the online English classroom of Indian engineering students if they are set in a way that they could probably encounter in their engineering workplace. Moreover, clear and precise instructions mirroring the workplace would also be very beneficial. The English teacher should try to anticipate the workplace needs and frame the tasks incorporating them. This will help prepare the students for their job.

A task for informal written communication could be to ask the students to write an e-mail to their team members or assistants. Precise instructions should be given. For example, a student could be asked to consider him/herself to be the team leader who needs to attend an engineering exhibition abroad. He/she should write an e-mail to the team members explaining the reason for his/her absence, the dates of his/her absence, and the

work to be done in his/her absence in 30–40 words. Google Forms could be used to administer this task. The teachers may also ask the students to send the assignment to the specified teacher's e-mail ID created for the purpose of evaluation. For formal written communication, a student could be asked to write a report to his/her manager as a part of a progress meeting after six months in a new job. The report should explain his/her achievements, any problems he/she faced, and so on, in 200–250 words. In these tasks, correct content, coherent organization of the content, the appropriate use of diction and format according to the type of communication, adherence to the word limit, correct spelling and grammar, and proper use of punctuation are the criteria to be focused on and assessed.

Oral Communication: The students of engineering should be able to (adapted from Mourtos, 2015)

- present their ideas well-organized, following the guidelines of the institute/company;
- describe visuals effectively;
- communicate precisely and coherently, conveying all the vital details about projects or experiments within the given time frame;
- listen intently, ask questions to clarify information without interrupting, and disagree with opinions politely and respectfully.

Group discussions, public speaking, and presentations are some of the tasks that are done in English classrooms to develop oral communication skills in Indian engineering classrooms. These tasks also should mirror their workplace environments. These tasks could be made more effective by choosing topics that could potentially be discussed in a workplace. Role-playing tasks could also be considered in which students are assigned different roles like manager, team leader, and team members. This task could also be done online through Zoom, MS Teams, Webex, and Google Meet. The students should be given time to prepare for their respective roles. This could be done through breakout rooms. After the time limit for the preparation is over, the students could be asked to make their presentation. The role of students should change in another discussion so that everyone plays all the roles. At the end of the tasks, the teachers could give feedback to the students on how to improve their communication skills, besides the practice and experience they have gained by participating in the tasks. Peer assessment could also play a significant role in such tasks. In these tasks, the students' ability to express their thoughts clearly and

coherently is assessed. Besides, the use of appropriate tone, confident body language, and the ability to listen attentively, comprehend others' opinions, and maintain online etiquette are also assessed.

4. **Collaboration Skills**: To incorporate the shift towards collaborative tasks in the twenty-first century, ATC21S has expanded individual problem solving towards collaborative problem solving. ATC21S collaborative problem solving task depends on human-to-human and computer-supported collaboration settings. The participants are arbitrarily paired to collaborate in diverse problem scenarios. The scenarios would vary enormously in their setting, yet they would all require the participants to simultaneously utilize the problem solving and collaboration skills. It could even bring participants from different countries together.

In Indian engineering education, a human-to-human setting for teamwork skills can be created by incorporating paired projects and group projects. In the English classroom, the students could be asked to embark on group projects, group discussions, and debates. An interesting task to be implemented in the English classroom of an Indian engineering college is to divide the students into many teams and produce a short play, maybe with an engineering theme. While producing plays in an online classroom is challenging, tasks like group projects and group discussions can be carried out effectively. For group projects, the students could be asked to do an online survey using tools like Google Forms, Survey Monkey, and Zoho Survey, and then submit the report. The students could select any topic of their interest for the survey. The students may be interested in analyzing the product feedback and customer satisfaction of a popular product or design, or the students might be interested in current talking points like online learning. The target audience of the survey would be decided according to the topic selected. From a collaborative standpoint, the main focus of the group project is to make the students work cohesively as a team. The language aspect focuses on enabling the students to present the data collected, the interpretations, and the findings in the form of a report. Report writing is an essential skill for engineering students as they would have to write reports like feasibility reports, progress reports, and evaluation reports as an engineer. Applications like Google Sheets and Google Docs have made collaboration easier in an online environment. Microsoft Office 365 and Microsoft Office Online both allow for

collaboration via OneDrive. There are also many other collaborative tools like Zoho Docs and Dropbox Paper. Group discussions and debates can be effectively carried out on online teaching platforms like MS Teams. Breakout rooms can be used, and the members of a group can be assigned to one room to facilitate discussion. The teacher can monitor only one room at a time. The students in the group could be shuffled for each discussion so that the students get used to working in new and diverse teams. Kialo is a free online platform designed to foster group discussions and debates in classrooms. Using Kialo, the teachers can create private discussions based on a topic, and then the students can add their "claims." It is also easy to monitor the individual student's contribution in Kialo. Flipgrid is another simple tool to use in online classrooms. This platform enables the students to participate in the discussion by recording and sharing a short video. In a group presentation, the students should be aware of the order in which they would present and follow it accordingly. The next presenter should be ready when a student is presenting. The group members should also anticipate any unavoidable issues like poor connectivity and be ready to step in whenever necessary. The group leader should coordinate their presentation so that everything goes smoothly and on time.

In these tasks, the students' ability to work effectively in various teams, interact with their diverse team members, manage time, shoulder responsibility, contribute productively to their team, help and guide their teammates, and manage and lead the team are focused. Thus, the criteria for the assessment of collaboration skills include the students' interpersonal engagement, focus on the task, commitment to the team, leadership, and decision-making abilities.

The outline of tasks and skills set along with their assessment criteria and students' outcome is tabulated in Table 9.1.

Discussion

Teaching and assessing twenty-first-century skills through online teaching platforms is an arduous task. The inclusion of twenty-first-century skills in the engineering curriculum is essential for the students' success in their workplace as well as the quality of engineering education, especially in this time of swift transformation towards a digital learning environment following the COVID-19 pandemic. This transition has resulted in the development of many innovative and effective online teaching and learning tools, and the teachers have to utilize them effectively in their

Table 9.1 Outline of tasks, assessment criteria, and expected outcome

S. no.	Skills	Tasks	Assessment criteria	Expected outcome	
				Skill-based	*Language-based*
1.	Problem solving	Hot Chocolate, Olive Oil, Sunflower, Laughing Clowns, 'Holiday' task.	Comprehension of the problem, definition of the problem, plan of action, collection and analysis of data, interpretation of the results, solution to the problem, implementation of the solution.	Ability to consider all the possible solutions to a problem, analyze the pros and cons of all these solutions, arrive at the best solution suited to needs and applicable under the constraints.	Ability to present the solution with logical organization and clarity, use of appropriate discourse markers while comparing and contrasting the solutions, and use of appropriate diction while presenting the argument and persuading the reader/audience.
2.	ICT	Arctic trek, Webspiration, Second Language Chat, creating websites/magazine cover pages, PowerPoint presentation.	Use of appropriate applications, mastery of the tools and resources, creativity, originality, aesthetic factor.	Ability to use basic skills like downloading and retrieving the file sent, manage a conversation in the chatbox, use complex applications to edit pictures and create innovative and dynamic designs.	Ability to develop product with creative content or write-up, and use of appropriate diction, correct spelling, and proper punctuation and capitalization.

(*continued*)

Table 9.1 (continued)

S. no.	Skills	Tasks	Assessment criteria	Expected outcome	
				Skill-based	Language-based
3.	Communication	E-mail writing, report writing, group discussions, public speaking, presentations, role-play.	Content, coherence/ organization of the content, clarity in expression, comprehension, confidence, diction, spelling, grammar, punctuation.	Ability to express their thoughts clearly and coherently, use of appropriate tone, confident body language, the ability to listen attentively and comprehend others' opinions.	Ability to use appropriate diction and format according to the type of communication, adhere to the word limit, use correct spelling and grammar, and proper punctuation.
4.	Collaboration	Paired projects, debates, group projects, group discussions, group presentations.	Interpersonal engagement, focus on the task, commitment to the team, leadership, decision-making abilities.	Ability to work effectively in various teams, interact with their diverse team members, manage time, shoulder responsibility, contribute productively to their team, help and guide their teammates, and manage and lead the team.	Ability to communicate effectively and clearly without ambiguity, disagree politely, use assertive tone and language, adhere to time limit/word limit.

classrooms. Similarly, the assessments should also be facilitated to evaluate twenty-first-century skills as traditional assessment forms are usually not suited to measure the twenty-first-century skills. The tasks proposed in this chapter will help to improve and assess the four twenty-first-century skills—problem solving, ICT, communication, and collaboration—in Indian engineering students in an online setting. The chapter also delineates the assessment criteria and illustrates how to adapt the tasks proposed by the ATC21S framework as assessments *for* learning rather than assessments *of* learning in online teaching platforms. This helps to bridge the skills gap between students' skills and employers' expectations. Thus, the online teaching and assessment methods also enable the students to be successful globally in this competitive digital milieu. The upgradation in the curriculum and teaching and assessment methods will also augment the standards of Indian engineering education, as blended learning would be more prominent in the post-pandemic twenty-first-century education.

Conclusion and Recommendations

The chapter has identified a lacuna not only in the twenty-first-century skills necessary for engineering students but also in the methods and approaches for the teaching and assessment of these twenty-first-century skills. The review of literature has also established that effectively integrating the twenty-first-century skills in English classrooms could enrich the engineering curriculum, without diluting the core domain knowledge. This will help engineering students to acquire both the necessary 'twenty-first-century skills' and the requisite 'core knowledge' to thrive in the rapidly changing and competitive world. Thus, the aim of the chapter is consistent with the Indian National Educational Policy 2020's (NEP 2020) goal to "develop well-rounded individuals that possess critical 21st century capacities" (p. 36) in higher education. In this line, the chapter has explored how to integrate the tasks of the ATC21S framework effectively in the online English language classroom to impart and assess twenty-first-century skills. The chapter has focused on the four essential twenty-first-century skills for engineers—problem solving skills, ICT skills, communication skills, and collaboration skills. It has provided insight into the implementation of the tasks in the online English classroom of engineering students to promote and assess twenty-first-century skills in such a way that the English language proficiency of the students would also be developed. It has also proposed the assessment criteria to assist the

teachers in evaluating both the skill-based and language-based outcomes. Moreover, the chapter has focused on effectively adapting the pen-and-pencil tasks to an online setting and the computer-based tasks of ATC21S to the context of an English classroom in an Indian engineering college. In concordance, the authors recommend and suggest the teachers to adapt and integrate the teaching and assessment methods constructively according to their regional context and the latest developments to hone the students' twenty-first-century skills and their English language proficiency. Moreover, in spite of the proposed tasks being propounded for the engineering students, they can also be improvised and implemented in other STEM and non-STEM disciplines to promote the students' twenty-first-century skills and their English language proficiency.

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Communities and Engagement: Are Students Still Able to Demonstrate Empathy in an Online Course?

Misty So-Sum Wai-Cook

Context

The National University of Singapore (NUS) formalized Communities and Engagement (C&E) as one of the key pillars in the General Education Curriculum in 2021. This pillar aims to formalize engagement with communities in the learning process in alignment with the learning objectives. It is hoped that students' experiential learning and connections with communities will cultivate this quality of empathy in them so that it extends beyond the self in the future (22 February 2021, NUS News).

The College of Alice and Peter Tan is a residential college at NUS that promotes active citizenship and community engagement. It creates opportunities for students to work with different communities to instil a sense of empathy. The curriculum provides opportunities for students to partner with

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communities to use available resources to connect with the communities. Students then connect theory to practice by having experiential learning.

The transitions across the "borders" between the students' own comfort zone and the new community can be physical, social, emotional, cultural, or identity borders. Traditionally, this is done inside and outside the classroom. The curriculum promotes student learning by balancing inside and outside the classroom to instil a sense of social responsibility, ethical reasoning, and empathy that are foundational to being active citizens (Ministry of Education [MOE] Singapore, 2020). Inside classroom learning adopts the rigor of academic reading, research, and discussion and formulates hypotheses on the communities to prepare for field work. Outside the classroom, students are required to practice what they learn in working with the communities. Students are required to understand the needs and challenges of the communities and undertake specific projects that address the specific needs of the community (https://capt.nus.edu. sg/the-capt-experience/ce-capt) (Hayes & Cuban, 1996).

When COVID-19 started, I had to swiftly turn teaching and learning online like other educators around the world. The outside classroom component had to be taught online. It was no longer possible to teach students and engage the community partners in person. To maintain an effective way of teaching students effective communication skills and empathy, it was important to strike a balance between social, cognitive, and instructor presences to replace experiential learning. Experiential learning was replaced by speakers and discussions of cases.

This chapter discusses the online implementation of the course designs of a CAPT module "Communicating with communities in the twenty-first century". It also presents evidence of student learning based on their reflections to demonstrate students' ability to still learn empathy from interacting with stakeholders in an online environment.

LITERATURE REVIEW: LEARNING EMPATHY IN COMMUNITY ENGAGEMENT

Definition of Empathy

Empathy is multidimensional (Junker & Jacquemin, 2017). Empathy means being able to understand people's perspectives, feelings, and experiences and to appropriately respond with compassion (Batt-Rawden et al., 2013; Mohammadreza et al., 2002; Sheehan et al., 2013). It includes

both cognitive empathy and affective empathy (Mohammadreza et al., 2002). Cognitive empathy is defined as the ability to identify and understand the inner experiences and feelings of others. Affective empathy refers to the understanding of the emotional experience of another person (Mohammadreza et al., 2002).

Pedagogical Approach Used to Teach Empathy

According to "border pedagogy" theory (Hayes & Cuban, 1996), empathy can best be taught and learned when there is an appropriate balance between classroom learning and experiential learning in community engagement. Students' connections with their communities should "prompt students to understand their own culture in new ways, appreciate cultural differences, become more critically aware of social inequities and power relations, and envision a more democratic society" (Hayes & Cuban, 1996, p. 6). The learning of empathy requires both a cognitive and an emotional shift in perspectives. It requires people to "destabilize" their existing knowledge/feelings, gain exposure by engaging with the communities through service learning, problem-based learning, literature and community-based research (Hayes & Cuban, 1996), and critically reflect on their learning experience and how they understand someone else's point of view (Ochoa & McDonald, 2020). To promote students' learning of empathy, facilitators play an important role in designing/supporting the programme/course design, as well as supporting students and community partners (Cushing et al., 2013; Wood et al., 2018; Loebick & Torrez, 2016).

Substantial research shows that empathy can be learned, especially when there is a balance between academic learning in the classroom and outside the classroom experiential learning through community engagement and practice (e.g., Cunico et al., 2012; Mennenga et al., 2015; Ward et al., 2012). For instance, Yang et al. (2020) showed that a group of undergraduate nursing students were able to learn perspective taking and demonstrate compassionate care in a 2-week, 12-hour empathy education programme that included didactics, video demonstrations, situational teaching, problem-based learning, and task-based learning. Furthermore, Zhu et al. (2021) proposed these key dimensions in training empathy: introduce the world to students, the basic knowledge of empathy, master empathic skills, practice empathy, and evaluate empathic ability through reflection.

Research also shows that students can learn empathy in an online programme even if that was not the main focus of the programme (Hattink et al., 2015) and that students were able to retain the ability to empathize with others even after two months (Sentas et al., 2018). This was made possible when the instructors used several examples to teach students how to empathize with others affectively, behaviorally, and cognitively as part of the training (Teding van Berkhout & Malouff, 2016).

While the research on online empathy training programmes does not focus on teaching practices to engage students in learning, research on online teaching shows that instructor presence, social presence, and cognitive presence are important considerations in facilitating online courses (Garrison, 2000; Garrison & Arbaugh, 2007). Accordingly, instructors must be present to support students in learning and promote deep learning by creating a good balance between instructor–student and student–student interactions (Cannady, 2015). Furthermore, instructors should also engage students cognitively by presenting relevant subject materials (Garrison, 2000; Garrison & Arbaugh, 2007; Garrison & Cleveland-Innes, 2005) and create opportunities for peers to collaborate (Dumford & Miller, 2018). At the end of such a learning circle, students should be given the opportunity to reflect on learning.

Implementation: Pedagogical Approach Adopted in Teaching

This section aims to illustrate how a ten-week course titled "Communication in the 21st Century: Strategies and Challenges" was taught in an online environment. This course focuses on teaching effective communication skills/strategies required to work with various professions as well as stakeholders and beneficiaries in the community by understanding their emotional, psychological, and physical needs and perspectives. One of the key components in this communication course is the importance of listening and the demonstration of empathy.

Other than the absence of in-person classes and community engagement opportunities, the course content and training in empathy for the online course remained unchanged. In addition, instead of going into the communities, different community practitioners were invited to the online classes to share their experiences and perspectives, and students discussed case studies with the speakers and students.

This chapter illustrates how I taught one component of the communication skills, empathy. This included the teaching of the basic key principles of listening, knowledge of empathy, communication of empathy, and evaluation of empathic ability through reflection (Zhu et al., 2021). I will also share how I facilitated learning by striking a balance between providing sufficient instructor, cognitive, and social presences in a lesson.

Step 1: Readings

In the week that focused on the importance of listening, we discussed a reading titled "The Missing Half of Communication" (Macnamara, 2018). Students were prompted to think about the importance of listening as a team member and leader, understanding the physical, emotional, and psychological needs of others, definition of empathy, and how that could be demonstrated through compassion. This ensured that students had sufficient relevant knowledge on the topic to participate in the class and to listen to the speakers.

Step 2: Group Work—Sharing of Readings, Case Studies, and Personal Experience

After the students completed the reading before each class, they attended online classes via Zoom to discuss the readings and think about how the theoretical concepts could apply to practice in real-life case studies and link to personal experiences. To provide an effective online lesson, I ensured a good balance between instructor presence, social presence, and cognitive presence (Garrison, 2000; Garrison & Arbaugh, 2007; Garrison & Cleveland-Innes, 2005).

Sharing of readings and case studies: To cognitively engage students in a lesson on the importance of active listening and empathy, students were tasked to summarize one section of the given article they read and examined the process of communication (listening and empathy). The students were asked to analyse the possible reasons that contributed to the successful/unsuccessful engagement in a particular community that stepped up to help those in need during the COVID-19 pandemic. For instance, Group 1 was challenged to use the principle of listening and empathy to explain the successes/failures and the process of communicating/connecting with those who worked with seniors to use old hotel linen to sew

Fig. 10.1 Case studies used for group work and class discussion

useful items to areas in need in Singapore and the local region (see Fig. 10.1).

I provided sufficient time for student–student and student–instructor interactions (Abrami et al., 2011; Joksimović et al., 2015) to engage students in learning during class. To engage students in learning in student–student interactions, students were grouped in Zoom breakout rooms to discuss the assigned reading section and case study. During the group work, students were still able to co-construct and apply knowledge and skills once they saw the value and relevance of the knowledge or skills taught (Bryant & Bates, 2015). As instructor, I joined each group to clarify ideas and contribute to their group discussions and prompt students to think further.

Class discussion: Each group took turns presenting their discussion points with the class (see Figs. 10.2 and 10.3). As shown in Fig. 10.2, students were able to understand the volunteers' objectives, as well as their

Fig. 10.2 Example of a group discussion points: application of the theory on listening to a case study

success in engaging with the stakeholders (hotels) and the beneficiaries. For example, students were able to use the concept of "structures and processes for listening" to underscore the need for people to identify key stakeholders and beneficiaries to work with, the right people to provide adequate resources, and the appropriate people responsible for communicating with each other to establish and maintain a good working relationship. Very importantly, the students were able to link the key skills in listening to explain the possible process involved in communicating and working through the project so that the volunteers' work met the beneficiaries' needs (see Fig. 10.3).

Under this particular topic, students were also encouraged to link theory to their own experiences in participating in CAPT's community engagement events in the past and present. As shown in Fig. 10.4, a student was able to explain how the importance of listening and casual conversations enabled the students to learn more about a group of visually impaired teachers and students to understand each other's perspectives and demonstrated empathy.

Fig. 10.3 Example of a group discussion points: process of establishing and maintaining successful contact with stakeholders

Fig. 10.4 Example of a group discussion points: students relating the theory on listing to their own experience

During all four groups' 20-minute presentations, each member of the group shared his/her findings. As an instructor, I prompted further thinking after each presentation for further discussion, and other students also asked questions/sought clarification.

Step 3: Linking of Theory to Practice—Invited Speakers' Sharing

After the students' group sharing and our class discussions on each topic, practitioners from the community were invited to speak in our online classes to share their experiences. For example, for the listening and empathy topic, a counsellor who provided Caregivers Support Centre at the Institute of Mental Health and a youth counsellor in a private counseling firm were invited to join us to talk about the importance of listening and ways to communicate and demonstrate empathy. They shared key areas such as what "listening" and showing empathy mean when they worked with different groups of people, the importance of understanding the cognitive, emotional, and psychological needs and challenges of youth, adults and seniors, and how we gauge whether our message is heard/understood.

Step 4: Students' Reflection

Upon the completion of a series of topics in the course, students were asked to reflect on 1–2 communicative strategies that they believed were important, relevant, and/or interesting and use their personal experiences/invited speaker sessions to support their thoughts and beliefs. While teaching a community and engagement module online is not ideal, students' reflections show that they were able to understand the theories that underpin the essence of communication in this module (e.g., listening and empathy) and link the relevant theories to practice by analysing case studies and listening to speakers' experiences. As seen from Table 10.1, one student's reflection shows that it is possible for students to link theoretical concepts to practice as they recounted their experiences in collaborating with stakeholders. The student's reflection highlights her own understanding of listening skills and the consequences of not listening/communicating with stakeholders, analysed the reasons for the miscommunication, and how it was possible to overcome the challenges when she realized the communication gap and the other party's perspective/challenges.

Table 10.1   Student's reflection on the importance of listening skills and empathy

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Student's reflection on listening skills and empathy in communicating with stakeholders during community engagement

As we frequently engage with different communities, <u>**we need to be able to practice active listening to understand their needs and collaboratively come up with a way to address these needs**</u>.[a] *In the process, miscommunications are bound to arise, especially as CAPTains and the communities might have different priorities, or different speech and working styles. Hence, we need to be able to apply strategies to mitigate and overcome miscommunications. While not necessarily related to this strategy,* <u>**the emphasis on** **active learning, patience, and empathy reminded me of an interaction with some beneficiaries. When I was a member in CAPTClouds 2018, we had to liaise with a beneficiary to conduct a children's carnival.**</u>[b] *This beneficiary oversaw an afterschool center in a low-income neighborhood in Lijiang, China. The beneficiary was not the most pleasant to work with as they had stringent rules on what we could do, such as "no using the storage room for anything", yet these were sometimes not explained until we had planned our activities. Their responses were also delayed, which made us very confused and frustrated as we had to work around these concerns. When we arrived, we realized that the beneficiaries' main concerns were less about surface-level rules and more on the underlying message—for example, they were worried that we did not clean up after ourselves and did not want to deal with the mess. After we reassured them and showed them that we were reliable, the beneficiaries were easier to work with. This reminded me that active listening and identifying the main message—and addressing that concern—is important. We also realized that the beneficiary was severely understaffed, which led to their harried and delayed responses as they had many urgent matters to deal with.* <u>***It drives home the message that empathy is important as we likely do not know the whole situation. Making assumptions would only lead to more negative feelings that might further hinder our communications. If faced with miscommunications or unhappiness, we should try to repair the situation by practicing empathy, listening intently, clarifying ourselves sincerely, and let our actions speak for themselves.***</u>[c]

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[a]Importance of listening and consequence of not communicating with stakeholders

[b]Importance of learning about patience and empathy in community engagement. Description of the problems encountered in communicating with a stakeholder

[c]Reflection on the importance of empathy to avoid miscommunication

Challenges and Recommendations

Learning effective communication skills, for example, appropriate ways to listen and demonstrate empathy, requires both a cognitive and an emotional shift from the "self" to others. It requires people to step out of their comfort zone by crossing physical, social, emotional, cultural, or identity borders (Hayes & Cuban, 1996). Ideally, this should be done in a face-to-face environment where students get to experience first-hand the

application of theory to practice as they engage with various stakeholders. However, similar to previous research, students' reflections show that it was possible to teach the importance of listening skills and challenge them to link theory to practice in these four steps:

Step 1: Readings
Step 2: Group work—sharing of readings, case studies, and personal experience
Step 3: Linking of theory to practice—invited speakers' sharing
Step 4: Students' reflection

However, to promote students' learning of listening and empathy face-to-face or online, facilitators play a critical role in designing/supporting the programme/course design, as well as supporting students and the community partners:

Designing/supporting the programme:

- Instructor to facilitate learning (not instruct)
- Do not compromise academic rigor; make service learning fun and meaningful for all students and stakeholders
- Recognize the complicated and ever-changing process of service learning (remain flexible and have back-up plans)
- Ensure sufficient time for students to develop ownership and gain experience

Supporting students:

- Provide sufficient training and support to enable students to succeed and regularly monitor and evaluate their service-learning process
- Provide structured opportunities for reflection (link theory and practice)
- Engage students in responsible and challenging actions for the common good

Supporting community partners:

- Establish purposeful community partners: match learning goals and to the chosen community partners

- Communicate clear goals, learning objectives, and expectations and establish a sense of commitment with community partners (Cushing et al., 2013; Wood et al., 2018; Loebick & Torrez, 2016)

In the whole learning process, there must be sufficient relevant and interesting information to cognitively engage students; instructors must also facilitate and prompt students' thinking so that they can see the value and relevance of the theory and how it can be applied in the real world. The instructors must also provide sufficient time for teacher–student and student–student interactions. In addition, students must also be given opportunities to critically reflect theory and practice. Thus, students can think about how to connect different thoughts at the individualistic, cultural, and structural levels (Junker & Jacquemin, 2017; Thompson & Pascal, 2012).

Conclusion

Community engagement must have both academic rigor and experiential learning opportunities. Teaching communication skills without allowing students to explore and demonstrate the effectiveness of their skills is not ideal, though not impossible. Classroom learning, in both face-to-face and online platforms, should equip students with relevant knowledge so that they understand the rationale of practices. Outside the classroom, students should have opportunities to practice the knowledge they learn with different stakeholders. In addition, students should critically reflect on their knowledge and experiential learning. Reflection is important because it leads students to deeper thinking and allows them to consolidate their engagement and learning, which may take several steps and link between past and present. Although not ideal, students are still able to link theory to practice when they analyse case studies and listen to speakers in an online environment. Communication skills and empathy can still be learned in a conducive student-centered learning environment online. This can only be achieved if there is an appropriate balance between cognitive, instructor, and social presences in the online class. Beyond the inclusion of academic rigor and experiential learning that prompts and challenges students to think, see, and act beyond their own "borders", instructors must facilitate student learning appropriately by providing sufficient teacher–student and student–student interactions. The elements are critical for both face-to-face and online learning environments.

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Innovation in the Use of Technology in the Class

CHAPTER 11

Navigating Digital Environments One Step at a Time During COVID-19

Abhishek Bhati and Esther Fink

Introduction

When COVID-19 first emerged in 2020, no one quite envisaged the profound and lasting impact it would have on societies and economies worldwide. The pandemic drastically accelerated digital transformation and forced educational institutions to reconfigure their approach to learning and teaching. At this stage, JCU already had mature procedures for digital teaching, learning and assessment in place with a focus on pedagogically sound use of technology and a positive student experience (JCU, 2021). The JCU curriculum framework is grounded in student-centered constructivist pedagogy, to help students construct meaning through active learning and reflection. It reflects the importance of a holistic, positive

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university experience for student success (Harding & Harrison, 2015; JCU, 2017). The JCU model acknowledges the role of identity and the need to build shared understanding, values and mutual respect. To that effect a variety of on-campus and online experiences were in place to foster a sense of identity and belonging and cultivate strong relationships within internal and external communities. Faculty could draw on systematic learning design and review processes and professional support. Nevertheless, the transition to a fully online environment afforded significant changes. Effective online learning is more than content transmission. The Community of Inquiry (CoI) framework (Garrison et al., 1999) outlines how social and cognitive interactions shape educational experiences and manifest in effective co-creation of knowledge through collaborative exploration of ideas, thoughts, and beliefs. Effective learning designs must consider how learners will engage with content and peers and how faculty best facilitate interaction.

During the pandemic, teaching practices and learning environments had to adapt to constantly changing circumstances and restrictions. Faced with limited access to social networking and informal exchange opportunities, the institution needed to embrace the challenging transformation and establish a sustainable change process. Finding new ways to navigate the digital space in order to maintain wellbeing and connectedness of staff and faculty was of key importance. The close collaboration between faculty and staff helped create online learning opportunities that engage students as active learners thereby building new ideas and concepts based on their own discoveries. In designing and planning classroom activities, the digital activities are interactive and student-centered while the lecturer facilitates a process of learning in which students were encouraged to be responsible and autonomous and in turn maintain a supportive and inspiring learning environment. The experience highlighted the necessity for a holistic problem solving by tackling complex scenarios and competing interests in incremental steps to maintain campus culture in a time of crisis.

Literature Review: Approach to Reflective Inquiry

Building University Community Through a Holistic View of Problem Solving

While higher levels of social connectedness with peers and instructors is linked to higher levels of overall satisfaction among students (Cherner, 2020), Lack of interactivity, authenticity, and support are longstanding

issues in online HE and the pandemic reinforced the importance of addressing them (Openo, 2020). CoI extends beyond social interaction to a deeper approach. Social presence includes embracing institutional values, building trust and rapport; cognitive presence is about constructing knowledge and meaning-making through reflection and discussion; while teaching presence is about purposeful design, monitoring and mentoring of the learning experience (Garrison, 2007). Students are active contributors, not passive recipients in this environment. Purposeful interactions with content and peers are key success factors for positive online student experiences and help build supportive faculty communities (Anderson, 2008), while reflective practice is critical to inform future action, as the practical examples in Chaps. 4 and 5 elaborate.

Exchange of ideas, collective critical inquiry and reflection are essential for conscious, effective practitioners. Communities of practice (CoP) provide a mechanism to transfer and advance knowledge and build shared understanding (Lave & Wenger, 1991). Therefore, CoI principles must result in learning designs and strategies that balance cognitive, social, and teaching aspects to bring individuals together in an active learning community (Fiock, 2020) and foster life-long learning skills.

Institutional Culture as a Backbone for Agility and Responsiveness

In today's fast-paced, ever-changing digital learning and teaching environments agility is essential. Successful institutions need to balance stability with dynamic processes to respond quickly to change. In a teaching context, agility translates into a renewed focus on meaningful engagement, where individuals collaborate and bring ideas and expertise together to achieve the mission of education (Krehbiel et al., 2017).

Successful digital learning and teaching requires a culture of continuous improvement, dialogue and sharing between faculty and staff to address the main challenges to student success and retention (Dunlap & Lowenthal, 2018). It is the shared purpose and values that translate policies into meaningful interactions, while individual actions and dialogue strengthen the cohesion and facilitate collaboration (Aghina et al., 2020). The pandemic crisis reinforced the importance of sensitivity and flexibility for relevant learning designs, sustainable teaching practices and effective solutions that can be improved over time by reflecting on practice through CoIs.

Pedagogical Approach Adopted in Higher Education Teaching and Learning

Good teaching practice takes a sincere interest in the individual development of students and fosters curiosity. Research has shown that higher levels of social connectedness with peers and instructors are linked to higher levels of overall satisfaction among students (Biggs, 2003). Inspired by Lowenthal and Snelson (2017), we aim to promote connectedness between students, their peers and faculty in their learning. Our holistic approach seeks to foster academic culture as well as enable collaborative and professional learning. It is guided by Garrison's CoI framework, which identifies three main elements that shape online experiences and support community and personal development: *Social Presence* helps build and support a learning community. *Cognitive Presence* manifests in learning designs that foster engagement with ideas and concepts through critical inquiry and discourse while *Teaching Presence* includes instructional scaffolding, facilitation of discourse and direct instruction. JCU strategic initiatives in response to the pandemic sought to strengthen *Social Presence* through institutional online events and by establishing support networks for students facilitated by peers, the Learning Centre and the Wellbeing Team. For example, the Learning Centre has successfully implemented "Digilearn"—a digital access and literacy program helping new students to succeed in the online learning environment. The library provided additional e-resources such as e-books and research apps which faculty sought to incorporate in meaningful learning activities and constructively aligned assessment.

Peer tutors working alongside academic and professional staff became essential links to their peers and helped foster a sense of community. Faculty were challenged to adapt in-class activities to a fully online environment and re-interpret *Teaching* and *Social Presence* to foster engagement, meaningful interactions, purposeful relationships and self-directed learning (Wong et al., 2021). Agility relies on short feedback loops and regular feedback from all stakeholders to take quick action and stay on track.

Opportunities for faculty to network, exchange ideas, discuss issues and concerns are essential (Brooks, 2010; McAlister, 2016), even more so in times of crisis (Bolisani et al., 2020). Regular opportunities for collegial dialogue through COPs helped faculty share experiences, reflect, and establish much-needed common ground on processes that enable digital

learning and discuss ways to effectively re-imagine on-campus activities in collaborative online learning settings whilst establishing and maintaining cognitive, social, and teaching presence. The exchanges resulted in interventions ranging from strategies for effective synchronous/asynchronous discourse, events such as virtual open days and career fairs, to equitable online assessment and ways to maintain teaching presence online. Faculty CoPs met regularly to discuss digitally supported teaching and share their experiences. The constructive professional exchange together with social activities such as virtual catch-ups and wellbeing workshops helped reduce the feeling of isolation in a pandemic hit-work environment, establish an effective support network. A faculty member reflected: "*Student feedback helps me reflect … and adapt my course to the new generation of students. We share teaching practice with other academics through academic forums and communities of practice (COPs) both internally and externally. The collegial dialogue is a meaningful way to enhance teaching practice.*" The implementation of the CoP approach provided opportunities to move from troubleshooting and sensemaking to critical reflection. By sharing experiences and discussing their strategies, faculty and professional staff were able to support each other, provide multiple perspectives across disciplines, and collaboratively devise a consolidated approach to digital learning, teaching, and assessment.

Discussion

Lefebvre's work (Lefebvre et al., 1991) reminds us that digital technology can create spaces of alienation and this calls for a humane digital society with a self-managed, socialized digital landscape where digital citizenship prevails (Fuchs, 2018; Wong et al., 2021). JCU's effectiveness in contextualizing social learning is exemplified in a new digital onboarding process (Digilearn) and a series of initiatives to sustain the delicate balance of cognitive presence, social presence, and teaching presence in a fully online environment. The institution extended CoI beyond the learning environment into shared spaces and support services, university culture and student life. The close collaboration between all faculty and professional staff helps establish integrated processes rather than individual solutions to existing challenges by establishing and finetuning digital learning environment in a volatile operational setting. The communal problem-solving also facilitates cross-disciplinary collaboration and engagement across faculty and professional staff at all levels. At the same time, the CoP nurtures

a social support system that is effective in reducing anxiety and uncertainty in stressful circumstances. The University of Padova, Italy reports a similar success story with CoPs and highlights the need for recognition and appreciation of grassroot work at higher levels (Bolisani et al., 2020).

Even before the pandemic, our policy mandated a minimum online presence in the Learning Management System for every subject with processes for digital assessment and feedback. This preparedness permitted faculty to focus on adapting learning activities to changed circumstances and develop assessment alternatives to proctored exams. The policy is underpinned by a set of procedures with detailed expectations and guidelines for the student experience. A core principle is that student success is built on their whole-of-university experience which commences with their first encounter with the institution and exposes them to a broad range of activities designed to build skills and confidences and to prepare students for life in the real world. Our account of JCU measures during the pandemic (Wong et al., 2021) highlights how positive learning and teaching experiences rely on our institution's ability to provide opportunities for engagement across all levels. The close collaboration and mutual support between academic and professional staff were an important success factor. As our colleague (Delante, 2020) points out, the ability to weave between academic and professional domains is essential for student-centered approaches, relevant institutional policies, and practice changes.

A whole-of-university experience must consider all aspects of university life and extend beyond campus into the professional world. Service-learning and work-integrated-learning (WIL) remain big challenges, despite some positive progress. Internships remain of limited availability. Therefore, capstone experiences such as the Multidisciplinary Project that focus on real world problem-solving (RWPS) are more important than ever. Facilitating such projects in times of the pandemic required creative thinking. As part of an Industrial Attachment program with one of Asia's fastest-growing artificial intelligence companies, our marketing students conducted a research project remotely, amid social distancing measures. Tourism and hospitality students from Singapore and Germany collaboratively published a book on Service Learning. The resulting anthology emerged from a joint integrated research seminar in Business Service Management, which began with a study-trip in 2017 and continued online (Thirumaran et al., 2021). In light of current circumstances, such collaborative digital learning opportunities with industry and international partners will become increasingly important in the future.

Conclusion

The effects of the global pandemic are constant reminders that we live in a highly complex and interconnected world. This highlights, yet again, that we cannot solve problems in isolation. Small changes can have a big impact and result in long-term change. We have seen multiple evidence that collaboration is likely to achieve better outcomes. As such, building a supportive community within and across HE institutions to share knowledge, skills and ideas is becoming more important than ever. Sharing teaching practice with other colleagues in academic forums and communities of practice (CoPs) both within the university and beyond facilitates collegial dialogues necessary to enhance teaching practice and evaluate digital learning environments. It is essential to foster collaboration and collective reflection across levels and involve students as co-creators in the process.

Through our reflection on agile change management in Learning and Teaching during COVID-19, we identified four themes essential to digital learning design and facilitation as our main contribution that underpin the literature and advises practitioners: (a) fostering a supportive institutional community, (b) achieving a holistic view of problem solving that considers both social and cognitive aspects, (c) continuous improvement and knowledge management, and (d) increasing institutional agility and responsiveness by empowering staff and students to co-create, communicate and collaborate.

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Practical Reflections on Meshing the Analogue and Digital Teacher Self Through Pushed Change

Stephen J. Hall

Introduction

Educators have been schooled and trained in the transmission mode of teaching and learning in an analogue age (Prensky, 2001). Yet, in the current decade, our sense of self as an educator involves one's online presence, both personally and professionally, as we have been pushed into changes of how we present ourselves as online beings and as well as how we curate learning (Dovchin & Pennycook, 2018; Stockwell & Reinders, 2019). The online facilitator is a transition thrust onto some, while it extends others already engaged online. The COVID-19 pandemic pushed educators into rapid learning as "digitally extended" facilitators of learning (Parkinson et al., 2018). However, perhaps many educators did not

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move into stimulating presence or critical engagement by blending online interaction across different modes, such as the use of images and audio clips blended with the more familiar, teacher-fronted online delivery. There are opportunities for reflection through comparing our everyday digital identity with how we represent ourselves as digitally savvy educators. We educators and facilitators of learning actively create "digitally extended" representations of ourselves, as many of us are expressing ourselves through varied textual modes mixing words, images and audio in everyday activities. Building on reflection into our everyday online activities, as well as when we work as educators, we can create classroom reflective activities for learners to critically audit their own online image across modalities while building an awareness of digital literacy.

Literature Review

A starting point for educators is often the sense of self and how she or he sees the world, as Farrell notes in his work on reflective education (2007, 2021). Stenberg and Maaranen (2020) describe how an educator's sense of self, their identity, links to the individual's life experiences and social relationships, enacted in varied modes of communication. Their Finnish research and other studies (Dailey-Hebert, 2018) show that the complexity of teachers' self-images manifests in different voices with context-driven positioning. Now many contexts are online, rather than face to face. Positioning of identity, whether online or offline impacts on interactions facilitated between educators, learners and content (Beauchamp & Thomas, 2009; Sachs, 2005; Søreide, 2006). The positioning of the teachers' sense of who he or she is pedagogically could include how consciously reflective an educator is of one's presence and image making within the digital world, of which we are all now part (White, 2020). Questions remain as to how consciously or critically we embrace the reality of being pushed by online delivery into being a digitally extended educator (Parkinson et al., 2018). It may be useful to reflect on how the digital persona is created, as I shared with students my struggle to use website architecture and how I wanted to position myself online.

Being digitally extended links to the concept of digital literacy. Pedagogy to develop digital literacy has been addressed in American research by Sabado (2018). He explores the need to link critical pedagogy and nurturing creativity to the development of digital literacy, citing the National Educational Technology Standards and describing a digitally literate

learner as a person who can analyse and use information gained collaboratively through digital media to demonstrate creativity and critical thinking, while adhering to the ethical and social norms related to technology (2018). Such literacy includes photo-visual literacy, creative analysis and critical thinking about information sources, whether textual, visually based or mixed mode (Eshet, 2012). In the classroom, this means learners being able to unpack the currency and validity or truthfulness of images and podcasts and being able to read inferences, as well as assess bias through a lens of criticality, as will be described later.

Koehler et al. (2013) suggest a number of areas for educators to develop within the concept of Technological Pedagogical Content Knowledge (TPCK) (Harris et al., 2009). This involves internalising how teaching with technology requires knowledge of the ways in which content concepts are represented with technology, learning strategies facilitated with technology and how everything across varied modes can be co-constructed to help students develop new epistemologies (Koehler et al., 2013; Vallance & Towndrow, 2007). Such concepts lead us to return to the facilitator as an ongoing learner in a rapidly changing digitalised world, in which the pervasive reality requires a critical analysis of information, linking of images to words and critically reading changing forms of information exchange such as WhatsApp, Twitter, Tik Tok and Switch. While many educators and learners are digitally extended by being involved in image creation and sharing, as digital communication through social media, the challenge is to link what may be social behaviour to teaching and learning.

Meshing the Analogue and Digital

Analogue and digital expression is becoming increasingly fused in many fields such as with language teaching and within music. In the popular musical world, the idea of meshing or creating a mashup is to take parts of different tunes and produce something identifiably more than the sum of the parts (Myers, 2019). Using existing melodies and fusing them needs thinking beyond two components in a creative way. I will argue that with analogue or print texts and with digital texts that we could also be "meshing" and blending modes, rather than seeing print-based texts and digital texts as an unbridgeable dichotomy of difference. Meshing or mashing up digital and analogue modes already happens, with electronic paste-it notes and paper-based note taking while online, to describe a simple example of

many mixed modalities. One pedagogic example is that of the work of Burgess and Rowsell (2020), who used an e-portfolio approach with immigrants whose written literacies varied, to capture ideas through a multi-modal approach of print, recordings, videos and graphics.

Such an idea of fusion of newer means of creativity with older tools is not a new cognitive response. Information historian Ann Blair (2011) notes that scholars were alarmed by the onslaught of information which Guttenberg's 1450's invention of the printing press brought. Scholars, then the gatekeepers of information, responded to what Gottfied Wilhelm Leibnitz called a "horrible mass of books which keeps growing" by assembling curated collections called "forilegia" or bouquets of text; an earlier kind of blogging (cited in Blair, 2011). There is a pattern here, one of several over the centuries, which demonstrates the human capacity to adapt to impactful technological development in a creative way. This is described with numerous examples in the persuasive book *Smarter Than You Think. How Technology Is Changing our Minds for the Better* (Thompson, 2013). The author argues that humans have at numerous times in the past gone beyond judgmental panicking at the loss of the standards of past communication, as with earlier statements about the destructive force of wireless radio or SMS killing the written word. It is suggested that the human capacity to creatively respond to new tools is a far more positive and impactful response than lamentations over a lost golden era of penmanship. Contemporary examples of this can be seen in the development of digital storytelling and multi-modal creation which builds language acquisition (Cheetham, 2019; Towndrow & Kogut, 2021). The multimodal experience of learners as described in the research of Ollerhead (2019) is a case study of how migrant English language learners share language development and their narratives through diverse visual and aural experiences with translanguaging across written, aural visual and mixed media creation. Some teacher educators create multimodal experiences emphasising the importance of narratives woven with images, using and creating them as part of broader literacy development for seen, heard and written texts (Keddie, 2009; Peachey, 2021). They, and other materials developers, suggest that critical and creative literacy across varied modes develops employability skill sets, as well as deepening and understanding one's own identity and learning style. We now turn to classroom pedagogy and implementation of a critical reflective awareness of being digitally extended as educators and as learners.

Reflective practice linked to change derives from critical examination of what one is doing as a practitioner (Farrell, 2021), so that working with the framework of modelling digital literacy requires examination of how one works with constructing one's own digital footprint (Benson & Filippaios, 2010). This concept was foregrounded in a class on digital literacy for undergraduate English for Information Technology students in a Malaysian private university. The learners were from diverse language backgrounds with both Malaysian and international students engaged in online learning. Learner tasks built on the educator facilitating student critiques of his own online presence. The starting point for engagement with learners which always engenders a response is what I do as an educator. I share my own understanding of how the ecosystems of digital representation portray myself, the facilitator. I ask learners to "Go Google me and then yourself." Learners were asked to assess the use of visuals, sound, text and ease of navigation or "branching literacy" (Eshet, 2012) within this writer's website. Then they were asked to use at least three search engines to search for other online traces of myself, writing a descriptor for appearance (form) and content (ideas) for each social media "presence" they found. For example, students generate adjectives for my LinkedIn page and then my personal Facebook page with descriptions arising, such as the contrast between "professional look" and "fun loving traveller." Learners are also asked to note if there are differences between what differing search engines generate and to search out why this occurs The process and limitations of using only Google and its powerful algorithms is also included as part of digital literacy training. Learner generated descriptors were shared on an online whiteboard, while a collection for later use was set up as reference materials for their later productive use in building their own online identity.

Classroom discussion developed on what words I use to describe myself, and what is the aim of building my own site, Facebook pages, LinkedIn and other academic social media links such as ResearchGate and Google Scholar. After critically describing what I had built, learners critically reflected on their own online presence as they had become aware of the wide range of sites and applications which could be linked and integrated into each platform. After producing adjectives describing their existing online presence, learners constructed either a website or a LinkedIn page incorporating the self-descriptors which they viewed as useful for an appealing professional online identity. These processes all tie back to how

we see ourselves as digitally extended individuals and how we consciously expand our own digital literacy.

Before constructing their own website or linked page as part of an e-portfolio, I asked learners to write adjectives describing how they see themselves as a learner and also as a professional in the making. This could be described as a reflective process, linked to learner perception of self, as a digitally extended professional in the making. Learners search for themselves online and link what they see in their own digitally extended presence, often Instagram or Facebook images. Learners do reflect critically in a mode of reflective self-awareness as they analyse their "selfie plus" constructed in the public domain of being online. Discussion of the differences in online presence and preferred descriptions of self can develop critical awareness of oneself as a digitally extended individual. Many learners shared that postings are not made with an awareness that one's "digital footprint" is perpetually online for all potential employers (Benson & Filippaios, 2010). Such critical awareness and enhanced digital literacy may build greater conscious custodianship of online interactions, as well as awareness of online identity creation.

In a pilot programme, undergraduate English for Specific Purpose learners and the course designers are building e-portfolios in which learners and educators have co-constructed the rubrics for assessment, to include the variety and quality of different modalities of "meshing" words, images, audio and overall page design. These portfolios are designed as a part of job or internship applications, so that meeting real-life needs motivates attention to multimodal quality. Initial verbal feedback from students suggest that they view e-portfolios as useful when they apply for industrial internships and many are positive about self-image building through multi-modal portfolios.

DISCUSSION

For educators, the post pandemic era is one in which the need for engaging online learning has pushed the development of digital literacy for all involved in the teaching and learning process. Our sense of who we are as educated begins with how we view ourselves in the process so that the sense of self has been pushed to include how we identify as digitally extended individuals. Reflection on this can be extended to how we rework teacher talk dominance online (see White, 2020 for a useful blended learning framework). Even formative assessment feedback can be in other

modalities than the written mode, with such applications as the free web-based app Voccaro. Accepting beyond the one correct answer and one modality of representing an idea, beyond the dominant written mode, could broaden learners' voices while they can be interactive through polling aps, for example, Kahoot, Mentimeter, Padlet, Quizzlet and Slido, as well as content generators with word clouds and digital white boards (Liang & Lim, 2021). As we facilitators are pushed to digitally extend our skill sets, we can easily model ourselves as digitally critical learners, rather than content transmitters. With the pandemic pushing many online, a plethora of tools has become available for co-constructing learning and acknowledging that we are all digitally extended individuals extending possibilities.

Challenges and Recommendations

The vocabulary of reflections on oneself and one's persona, either online or offline, may be unfamiliar to some learners. Describing oneself in a learning situation may also not be very detailed, unless there is a classroom climate of acceptance of self-disclosure, with a sense of safety, in which all involved open up to others with the sharing of positive descriptors.

Some recommendations follow:

- Analysing a learners' online presence could be scaffolded by brainstorming a list of descriptors which learners would like to see linked to their future professional image. The positive self-descriptors may need conscious development in cultures where modesty in describing oneself is the norm.
- Using word clouds and vocabulary generating software as well as sharing platforms such as Kahoot can provide online alternatives to generating vocabulary. There may be a perception that one is able to contribute to classroom wide sharing without judgement.
- Comparing online platforms can contextualise how personal descriptors can be presented in different text types and "meshed" with image selection. For example, the word limits and emphasis on visuals differs greatly between a personal blog and TikTok. The shorter text forms then push the learners to rank or prioritise the self-description words of phrases. Alignment of images with text and choosing those which may for example, enhance employability can be part of instruction so that there is reflection on "meshing" across

modes. In other words, it could be fruitful to facilitate discussion on matching images and the response they invoke with the words chosen as personal quality descriptors.

• Inclusion and development of video portfolios requires story building skills and development of awareness of the through line of the story being told. A preparatory activity on describing what makes for an effective short YouTube or viral clip could enhance awareness of how a successful "digitally extended individual" (Parkinson et al., 2018) achieves his or her communicative aims. Brainstorming of some of the technical aspects could enhance digital literacy awareness, for example: voice quality, length of spoken text, the use of images imbedded in images and so on.

CONCLUSION

As many educators and learners are involved as "digitally extended individuals," we are increasingly being pushed into multiple modes of expression, which are aspects of how we project ourselves. A critical approach to understanding and building an effective online presence does depend however on an educational setting being supportive of critical literacy and questioning of self and representations of reality (Burgess & Rowsell, 2020). An educational setting which supports educators as modelling themselves as ongoing learners is essential, if we are to remain aligned with the netscape and digital world which is central to our learners' lives. One hopes that educational administrators see that provision of online tools which enable educators and learners to be conscious multi-modal creatives remains as essential as it has been throughout recent, challenging times.

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Teaching Presence in an Instant Messaging (IM) Community of Inquiry (COI): Telegram as a Virtual Learning Environment (VLE)

Amira Firdaus and Sana Shahid

INTRODUCTION

Telegram is a cloud-based instant messaging (IM) platform with a monthly active user base of over 500 million people (Karimpour et al., 2021). Telegram is significantly more multi-platform friendly than other chat applications like WhatsApp since it allows users to use the same account simultaneously on any device, including phones, tablets, and laptops using a simple security check through code verification. All Telegram content,

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including images, documents, links as well as text, voice and video messages are stored in a secured cloud server, and requires less data and storage than its competitors (Sai Prasanthi et al., 2022).

This chapter offers a collaborative autoethnographic reflection of using Telegram as a virtual learning environment (VLE). Drawn together by our mutual interests in the teaching and learning (T&L) affordances of IM, the two authors collaborated to write this chapter. In writing this chapter together and learning more about Telegram, we ourselves became a dyadic mini community of inquiry (CoI). While the chapter is based on the first author's reflections of teaching via Telegram, the second author played a major role providing background and context on Telegram as an instant messaging platform, reviewing and interpreting relevant literature, offering insights to the first author's autoethnographic reflections.

When COVID-19 lockdowns in 2020 forced educational institutions and teachers to abandon their lecture halls and shift their classes online, instead of the video conferencing platforms used by most, the first author (thereafter referred to in the first person) turned to instant messaging via Telegram. Telegram emerged as a natural solution to facilitate my teaching delivery. My decision to turn to Telegram was motivated by two driving forces.

Firstly—and admittedly self-servingly—I had an already-established practice of using IM in the classroom, and I had a personal preference for communicating via IM. Since joining the IM platform WhatsApp in 2016, I have adopted a practice of using instant messaging groups to make class announcements, interact with students and share learning materials. Secondly—and perhaps more importantly—I was driven by a critical incident that occurred at the beginning of pandemic lockdowns. While doing some internet research on emergency remote teaching, I came across a Facebook page where students anonymously post confessions, or rather complaints, about their universities, lecturers and classmates. One particular post left a big impact on me. I read a social media post by a student anonymously pouring out her/his heart about the lack of understanding and support she/he faced trying to keep up with video-conferencing live classes despite spotty internet connectivity and other constraints that came along with the very sudden and unexpected shift to remote learning.

I was determined that no student in my class would fall behind his or her peers due to the digital divide. Telegram, a low bandwidth instant messaging (IM), allowed me to transcend the digital barrier. I knew that all my students owned their own smartphones and could easily download

and use the Telegram mobile app. From April 2020 up to the time of writing in June 2023, Telegram became the primary online learning platform for my undergraduate course on organizational communication. As campuses began reopening in 2022, I continued to explore ways to integrate new hybrid-and-physical classes into the existing frameworks of my Telegram-based IM learning pedagogy.

Drawing upon the Community of Inquiry (CoI) Framework (Garrison, 2009; Garrison et al., 2010; Shea et al., 2012, 2014), this chapter examines how Telegram's robust technological affordances facilitated a stand-alone mini virtual learning environment (VLE) with a discernable community of inquiry (CoI) for my online course.

Literature Review

In the following paragraphs we engage with related literature to present theoretical underpinnings for the chapter's approach to reflective inquiry. We begin with a brief review of literature discussing the uses of Telegram for teaching and learning (T&L). Next we introduce the Community of Inquiry (CoI) framework which we use as a benchmark to assess the effectiveness of my Telegram-based pedagogical approach. Finally, we present our approach to reflective inquiry.

Teaching and Learning (T&L) via Telegram

Telegram has a long history of being used to aid teaching and learning (e.g. Abu-Ayfah, 2020; Aladsani, 2021; Swartz et al., 2022; Utomo et al., 2020). One study even found that students in Telegram-based courses had a higher average success rate than students in classroom-based courses (Elfahal et al., 2021). Telegram is an application that can be used simultaneously across many browsers, mobile devices, and desktop computers. Academic users may look for journal papers and eBooks without using any additional browsers, websites, or programs by subscribing to multiple libraries via Telegram channels (Alizadeh, 2018). Many features of Telegram, such as sending big files, transcribing audio communications to text, and customizing sounds are well recognized. Furthermore, Telegram is also notable for its bots, stickers, groups, and channels. The integration of the Telegram bot on e-complaint applications at academic institutions have also been explored in research (Rosid et al., 2018).

Some drawbacks of Telegram were also reported in research, that is, a complex interface (Iqbal et al., 2020), high consumption of battery and cellular data, and inability to select more than one file for sharing (Aladsani, 2021). Furthermore, Telegram has frequently been cited as a platform where false information may spread quickly, in part due to its weak approach to content moderation (Bastani & Bahrami, 2020). For example, Western counterterrorism agencies will likely be significantly impacted in future by official and unauthorized instructions given via Telegram that may expose the followers to low-tech attacks, hacking, and operational security (Clifford, 2018).

The COVID-19 pandemic and its accompanying lockdowns have given rise to an emerging practice of using Telegram as the primary platform for teaching and learning, particularly among students (and teachers) with limited access to computers and reliable internet. For example in South Africa's University of Technology (UoT), two lecturers from the Engineering Faculty developed a Telegram teaching intervention as a low-cost and low-tech vehicle to deliver curriculum content and engage with students struggling with limited access to computers and internet data during the COVID-19 pandemic. While in Saudi Arabia, the College of Medicine at Imam Abdulrahman Bin Faisal University used Telegram to distribute educational resources including lecture slides and online question banks (Iqbal et al., 2020). Hence, we can say that Telegram facilitates the formation of an economical and effective online classroom environment as well as an inclusive and interesting microlearning experience for students during an extremely unstable and fearful period in world history.

Community of Inquiry (CoI) Framework

The CoI framework presents a dynamic model of the fundamental aspects for both the formation of community and the pursuit of inquiry in any academic learning environment. Originally developed by Garrison and colleagues (e.g. Garrison, 2009; Garrison et al., 2010) and more recently revised by Shea and colleagues (2012, 2014; Shea & Bidjerano, 2009), the CoI framework articulates the teaching, learning, social and cognitive processes central to personally meaningful and pedagogically effective learning. These processes are anchored upon interaction of multiple 'presences' within the learning environment—*teaching presence, social presence, cognitive presence* and *learning presence*.

The pioneers of CoI, Anderson et al. (2001) defined *teaching presence* as the development, facilitation, and regulation of conscious intellectual activity with its critical connection to learning and community-building that facilitates the achievement of personally meaningful and pedagogically effective learning outcomes. More recently, *teaching presence* has been defined as the design, organization, facilitation, and direct instruction and assessment usually undertaken by teachers in order to facilitate students' learning and achievement of educational goals (Shea et al., 2010). Garrison (2009) asserts that *social presence* refers to a participant's capacity to connect with the community, interact successfully in a comfortable and supportive environment and establish interpersonal connections by reflecting on their distinct identities. *Cognitive presence* is the support of higher order learning and critical thinking (Shea & Bidjerano, 2009). In other words, it is the ability of learners to generate and reinforce meaning through ongoing dialogue and speech in a constructive community of inquiry with the goal of developing critical thinking that integrates old and new information through assessment, communication and reaction (Garrison et al., 2001). *Learning presence* refers to the extent to which students are active learners who have control over their learning consumption and are behaviorally and functionally committed stakeholders in their own learning process (Zimmerman & Schunk, 2011), illustrated by self-regulation (i.e. self-discipline), co-regulation amongst peers and nodal positions of prominence wherein a student becomes a reference point for their peers (see Shea et al., 2014). This is also supported by the literature which indicates a teacher may enhance learner presence by offering students the opportunity to support their peers who are either less experienced or belong to same age group by imparting and sharing their own knowledge and skills (Honig & Salmon, 2021).

Reflecting-on-Action

My decision to adopt Telegram as my go-to online learning platform was a decision motivated by practical needs rather than pedagogical theory. In my process of conducting (and simultaneously planning and designing) the Telegram classes, I was concerned only with the here-and-now of posting the current week's class materials. I spent very little energy thinking about the Telegram class' overall framework or reflecting on my pedagogical approach. It was only after teaching two cohorts/semesters of the course did I properly stop to reflect upon my Telegram-centered teaching

practices. As such, this chapter's reflective inquiry approach is one that is based on reflecting upon practices, that is, actions, that were enacted in the recent past with the aim of analyzing and gaining deeper understanding of our teaching practices so as to inform our teaching in the future, that is, *reflection-on-action*. The term has been described in varying ways by recent scholars most of whom draw upon scholar Donald Schön's notions of *reflecting-in-action* (i.e. engaging in reflection in the midst of a task or project) to analyze one's practice and subsequently 'reframe' it based on the data collected (i.e. *reframing*) (Schön cited in Munby, 1989). This chapter takes inspiration from a more recent scholar's summary of Schön's work, as distilled in the brief excerpt below.

> *reflection on action after a finalized project or a specific situation [allowing] for critical reflection and the development of new strategies.* (Cendon, 2020, p. 192).

My *reflection-on-action* was precipitated in part by my students' positive response to the Telegram class, which further fueled my intrinsic motivation to teach via Telegram and to share my experiences and reflections with other educators, which I did through webinar presentations and a book chapter. My reflective inquiry attempts were inspired by positive feedback and positive experiences teaching via Telegram which led me to attend talks and to read guide books related to online learning. I stumbled upon the CoI framework for online learning, describing the various CoI 'presences' that contribute to meaningful attainment of learning objectives, leading me to compare the teaching and learning in my Telegram class against these CoI presences. As will be discussed below, my reflective inquiry of CoI presences in my Telegram class drew my attention to the imbalance between teaching presence, learning presences, social presence and cognitive presence in my class.

I used a variety of tactics to facilitate *social presence* by creating smaller Telegram groups for interactive small group discussion. To facilitate *learning presence*, I made attempts via my Telegram 'mini lectures' to break down learning topics into smaller chunks via short texts messages, short voice messages, and simple images as alternatives to presentation slides. To facilitate *cognitive presence*, I similarly designed short quizzes at the end of topics to support learning retention and stimulate thinking. I occasionally highlight and explain to my students the logic behind my use of short texts to deliver content and my use of mini quizzes as both formative and summative assessment of their learning.

Pedagogical Approach Adopted in Teaching and Learning via Telegram

Telegram's text messaging, voice texts, short video messages are perfect for breaking down information into smaller chunks and thus aids in improved learning outcomes and fosters productive discussion, particularly for a learner already adept at communicating via instant messaging. As a microlearning tool, Telegram may be used to enhance communication between teachers and students. One may simply enhance students' engagement by using a hybrid microlearning technique on Telegram. However, When I first envisioned using Telegram as the main (or only) platform for my online class, I initially aspired to use microlearning as my main pedagogical approach. Microlearning is an evolving elearning trend (Giurgiu, 2017), characterized by small learning modules and micro assessments (Bundovski et al., 2014) and short-time activities, (Hug et al., 2006) like small podcasts, mini paragraphs and brief definitions (Zhang & Ren, 2011).

However, at the time, I only had a superficial understanding of microlearning, and a very fuzzy notion of what a microlearning class might look like. My Telegram class consisted of creating multiple Telegram *groups* and *channels* which I instructed students to join via Telegram invitation links posted in the course Moodle page and main Telegram group. In my own Telegram account, I used Telegram's 'folder' feature to organize all Telegram groups and channels belonging to the same course. Each student joins a main class Telegram group which serves as the class communication platform used for announcements as well as informal chats. I delivered each weekly Telegram class in a separate Telegram channel. I posted channel invitation links in the main Telegram lecture channel.

I did not begin my Telegram class with the intention of creating a CoI as I only discovered the CoI framework sometime later. However, after two semesters teaching via Telegram, I engaged in *reflection-on-action* and realized that my teaching practices in the Telegram class serendipitously aligned with 'presences' in the CoI framework.

Teaching Presence and Learning Presence

I inadvertently enacted *teaching presence* quite extensively in the designing and structuring of my Telegram class in the following way:

1. Announcing the week's mini lecture via our class Telegram chat group, named the 'Class Communication Platform'.
2. Creating a new Telegram broadcast channel for the current week's topic and copy-pasting its link to a Telegram lecture channel that functioned as a portal or a table of contents listing the links to each week's Telegram mini lecture
3. In the week's 'mini lecture' channel, I posted the week's topic introduction consisting of:
   - A short video message welcoming the students and introducing the week's topic
   - A text message with an introductory summary of the week's topic
4. I conducted didactic teaching via a series of voice messages, text messages, images, links and attachments, arranged in a narrative order of subtopics or ideas, similar to the arrangement of subtopics/ideas in a traditionally-delivered lecture:
   - Most voice messages are between 5 seconds and 60 seconds long, some with captions (e.g. keywords and summary bullet points) to make it easy for students to identify the contents of the voice message
   - As a replacement for conventional PowerPoint slides, I post images of handwritten 'whiteboard' keywords, short phrases and diagrams/sketches to illustrate a point.
   - Often I provide links to external online sources such as YouTube videos, online articles, websites. Upon occasion, I attach PDF or Word files.
   - Occasionally, I will post interspersed text messages in the form of short notes or bullet points
5. I created an assessment activity in the form of:
   - a quiz created using Telegram's quizbot, and
   - a small group discussion using Telegram chat groups as 'breakout rooms' consisting of three to six students per group
6. I ended each weekly 'mini lecture' with a topic closing consisting of:
   - A short video or text message summarizing the week's topic and bidding students goodbye.

To some extent, the abovementioned Telegram 'mini lectures' did adhere to microlearning notions of delivering bite-size materials, as each individual Telegram voice message and text message was kept short, and I deliberately chose short readings and videos when sharing external

resources. However, each week's 'mini lecture' consisted of dozens of messages, and the entire 'mini lecture' could take up to an hour or more to complete, thus defeating the core microlearning practice of bite-size learning in under 15 minutes.

However, my partial attempts at microlearning serendipitously resulted in a pervasive *teaching presence*, as described by the CoI framework (Akbulut et al., 2022). It was achieved by responding to the questions and problems of the students, being approachable in the class Telegram group used for communication, and providing them with helpful, timely feedback.

Through a strong *teaching presence* in the Telegram class as described earlier, I facilitated a weekly *learning presence* among the students. The structured weekly mini lectures guided students through their learning, while the weekly pre-class announcements about the week's newly available mini lecture served as a gentle reminder to 'attend' class. Students then played their part in enacting *learning presence* through self-regulation of joining each week's class and reviewing previous lessons in a timely manner. Telegram channels record the number of views that a post has received, and through this I was able to ascertain the number of students who had completed the weekly lecture, thus indicating *learning presence* for each weekly topic. Additionally, I created small discussion groups which sometimes facilitated opportunities for *learning presence* where students practice self-regulation (e.g. being on time and respecting group norms) and co-regulation (e.g. taking lead to initiate discussion and to help remind each other of important tasks).

Social Presence and Cognitive Presence

I attempted to facilitate connection, identity and a sense of belonging in my Telegram class by using Telegram chat groups to encourage interaction, making an attempt to foster *social presence*. I regularly used the class Telegram chat group as our main communication channel where I interacted with students informally and encouraged them to interact with me and with each other. To create an informal and friendly atmosphere, I used emojis, GIFs and stickers in my chat messages. Taking cue from my chat messages, students also encouraged each other and sometimes even sent me encouraging messages, often using emojis and stickers as well. In addition to the main class chat group, I also created small Telegram discussion groups consisting of three to six students per group, in part to provide a

space where students could potentially feel a sense of belonging within a smaller group setting.

However, unlike the high degree of *teaching presence* and the highly evident *learner presence*, I found that *social presence* was not as strong in my Telegram class. It was usually the same few students who would reciprocate my attempts at friendly interaction. It was also the same few students who usually took initiative to ask or answer questions on behalf of the class. Similarly, not all the small discussion groups were active with conversations.

Students only interacted in these groups when I instructed them to discuss a weekly topic. I also learned that I had to post very specific instructions and guidelines, sometimes with marks, in order to get students to participate actively in the discussion group. However, in the slightly rare instances where students undertook active discussion in their smaller Telegram chat groups, I often noticed a high level of intellectual and academic discourse. *Cognitive presence* was often evident in the students' impressive efforts at discursive meaning making through group discussion. They displayed insightful ideas, and through back-and-forth discussion, they engaged in peer teaching, correcting each other's misconceptions and coming to surprisingly intelligent conclusions.

Upon reflection, I realized that such impressive *cognitive presence* only took place in response to my instruction to engage in discussion, coupled with clear prompts and detailed guidelines on how I expected them to proceed with the discussions (see Fig. 13.1). Additionally, students received instructions integrated in a variety of activities, including reading assignments, reflections, video lessons, discussion forums and voice messages.

In other words, *teaching presence* was a necessary prerequisite for facilitating the kind of *cognitive presence* I hoped for. The *teaching presence* that I found successful came in the form of both structuring the group discussion (i.e. specific question and prompts) and facilitating the discussion norms (detailed guidelines on how to conduct the discussion). I made an effort to incorporate group engagement and promote interactive, real-world discussions in the classroom by encouraging students to draw connections between the organizational concepts taught in the course and their own real-life experiences as organizational members.

At the beginning of the semester, students were asked to describe an organization they previously or currently belong to, and their role or activities in those organizations. Students enthusiastically shared their

Hi everyone

Please discuss the two concepts you learned about the two different ways of thinking about Organizational Communication:

> *- Communication in organizations*

> *- Organizations as communication*

To guide your discussion, below are two prompts you may use:

> *1) Share to the group what you find most interesting about the two different views of Organizational Communication?*

> *Or*

> *2) Share example of "organizations-as-communication" from your own experience as a member of an organization (e.g. student in a class/school; member of a club; part-time employee in a company)*

> *And*

> *3) Ask a question about something you don't understand about.*

Each person must:

> *- Share or ask at least one idea/question about the topic*

> *- Respond to at least two other students' post*

> *- In total, post or respond minimum three times in this discussion*

I hope the instructions above will help your discussion and peer learning.

Please respond to each other's comments and questions so that you can have a discussion and learn from another.

Fig. 13.1 Sample instructions for group discussion

experiences as organizational members. The organizations were varied, ranging from school or university clubs, associations and sports teams, to part-time or temporary employees in companies, their roles in family businesses, and even as entrepreneurs in microbusinesses. Throughout the

semester, in their quiz questions, final assessments and group discussions, students would use their own experiences as examples and case studies to illustrate or discuss concepts and ideas introduced in the course Telegram mini lectures.

DISCUSSION

As I write this chapter, I grew conscious of my *reflection-on-action* as a realization dawned on me that I had not taught my students how to organize their course in their own Telegram accounts. I realize that in this instance I did not adhere to a fundamental rule of e-learning which is to provide technology training to students. And this fundamental oversight means that I also failed my own core value of ensuring equal and fair access to my online class, as access is not only predicated on access to technology, but also the competencies and literacies to effectively use the technology. Hence, we can say that the utilization of devices and technology, accessibility and support are all equally important in order to provide a good e-Learning-based learning environment (Aquino & BuShell, 2020).

Furthermore, the notion of our class being a CoI is in essence an abstraction in my mind as I reframe the Telegram class through my dual teacher-researcher role. Unless they had somehow stumbled upon my webinar presentations, my students have not been privy to this teacher-centric reframing of their learning experience.

Nevertheless, while my Telegram-based classes initially emerged from an internally driven exercise of my teacher's prerogative, Telegram's inherent characteristics and technological affordances does make it a robust T&L platform with discernible elements of an online community of inquiry (COI). As has been argued for other online learning cases within the CoI literature, I similarly argue that *teaching presence* is possibly the most crucial CoI presence within a Telegram class. In particular, the design of the online course and the facilitation of course activities lie primarily within the teacher's control through his/her *teaching presence*. Furthermore, *cognitive presence* may very well be contingent upon a more traditional authoritative teaching style where learning activities are not optional but compulsory, whether they are made so through the introduction of grades or even through sheer insistence from the instructor. To truly facilitate a CoI, in my next Telegram-based semester class, my *teaching presence* practices must integrate Telegram VLE training and introduction of the CoI framework to my students to truly empower their *learning,*

social and cognitive presences. Students participate in activities other than reading, listening, or watching during active learning on Telegram to build meaningful relationships with other members of the class and to enhance their cognitive and learning capabilities. To help the students develop communication skills, the instructor should have them participate in large or small group talks rather than make them memorize information.

Conclusion and Recommendation

This chapter has presented theoretical and practical guidelines for researchers and instructors interested in incorporating Telegram into a blended-learning methodology, given that the CoI framework is a novel way to teach that has recently been introduced to e-learning practices. It is recommended that the primary goal of the class should be to grasp a community of inquiry or, at the absolute least, to comprehend the role of instructors and students in building a learning community. Furthermore, the concept of CoI should not be limited to the instructor alone. Students must also be made aware of the teacher's vision to expand a learning community in the classroom. After all, the bedrock of any 'community' rests upon meaningful engagement of all community members (Robinson & Hullinger, 2008). In a community of inquiry (COI), true *social presence* and meaningful *cognitive presence* is best achieved through engagement by both teacher *and* learner, that is, *teaching presence* as well as *learning presence*. We recommend academics to introduce CoI as a guiding framework for learning at the very beginning of the semester to better engage and socialize students into a meaningful learning community. We also recommend instructors to be mindful and deliberate in integrating CoI into the curriculum so as to maintain a balance between teacher presence and student presence in online and hybrid learning environments. We believe that this study will serve as a starting point for future efforts to both create and research robust online CoIs, within low-bandwidth instant messaging platforms like Telegram.

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ICT and Twenty-First-Century Skills for the Students of Engineering

Mekala Sethuraman, Harishree Charath Chandran, and Geetha Radhakrishnan

Introduction

Due to the COVID 19 Pandemic, the world has transformed at a rapid pace towards digital technologies. To meet the changing demands for the digital workplace, the students of the twenty-first century require additional skills apart from their subject knowledge and technical skills. This includes the set of twenty-first-century skills like creativity, critical thinking and problem solving, communication and collaboration. K–12 education in the United States and Europe has incorporated these twenty-first-

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century skills as part of their curriculum. In India, Central Board of Secondary Education (CBSE) has published a handbook of twenty-first-century skills comprising the skills set proposed in The Partnership for 21st Century Learning (P21) Framework (2009) in 2021. The CBSE board of India has also proposed the schools to integrate the target or desired activities of twenty-first-century skills in their classroom teaching. But there are no standard guidelines for inclusion of these skills set in the curriculum per se. Education around the globe has become progressively adaptive towards the online platform. The real problem lies in preparing the students according to the metamorphoses of the working environment in the twenty-first century through online platforms.

Further, due to the pandemic situation, the teaching-learning process in the digital environment has to adopt new technologies to impart the knowledge to the students. In this line, information and communication technologies (ICT) tools play a major role in online teaching. By and large, online teaching has many challenges for teachers and students as well. Apart from the technical difficulties like poor network connection, internet server issues, recharging the data pack for the mobile, audio and video settings of students and teachers, and so forth, there are also other constraints faced by the teachers like grasping the attention of the students in a digital environment. Further, with respect to the pedagogical perspective of engaging the students in the online class, the chapter discusses the role of Dornyei's (2001) motivational strategies in helping the teachers to motivate and engage their students in online classroom using ICT tools, such as Google Classroom, Hot Potatoes, Kahoot, and Microsoft Teams (MS Teams). Consequently, the chapter explores the plausibility for developing the twenty-first-century skills of the students by the implementation of motivational strategies in the online classroom employing ICT tools.

Review of Literature on Twenty-First-Century Skills

The twenty-first-century skills are the set of skills that help the workforce persist and achieve in the world of work. Previous studies have concentrated on teaching the four Cs to engineering students through various pedagogical approaches and methods. In accordance with this, the chapter focuses on the enhancement of the following four Cs of the P21 framework using ICT tools in the twenty-first-century classroom.

1. **Creativity:** In the twenty-first century, demand for creativity has been steadily increasing as digital technologies have abundant information and have ready-made solutions for critical situations. Technological advancement in the global workplace has elevated the expectancy of creativity among its workforce, and therefore engineering graduates are expected to contribute their innovative ideas for augmenting the productivity of the organizations. Consequently, the study results of Martinez et al. (2021) show that "creativity is a crucial skill for science and engineering professionals and an essential ability in the design process, especially to achieve innovative and potential impacts for humanity's well-being" (p. 1). Valentine et al. (2019) have conducted large scale research on examining the inclusion of creativity skill in the engineering syllabi. The findings of the research revealed that only 2% of the course outline have creativity-related material and only 1% of the course content engages students "in using creativity heuristics." In the workplace, it is essential for the engineers to think of new and unconventional ideas, identify the problems, diagnose alternative solutions, and create innovative ideas. Creative thinking comprises thinking abilities like reflective thinking, logical thinking, and analytical thinking. According to Sirajudin et al. (2021), creative thinking skills include

   looking for statements, questions, and reasons clearly; understand the information well by choosing reliable sources; pay attention to the overall situation and conditions; be strong with the main idea; maintain authenticity and fundamentals; look for alternatives and behave, systematically open-minded, and orderly; take a position accompanied by sufficient evidence, and look for as many explanations as possible. (p. 1)

   In addition, Valentine et al. (2017) have compared the pen-and-paper-based approach and web-based approach in developing the creativity and problem-solving skills of the students of engineering and showed that the web-based tools can be adopted as supplementary material to enhance the students' creativity and problem-solving skills. In this regard, the chapter discusses the use of ICT tools along with motivational strategies to develop Creativity skills of the students of Engineering.

2. **Critical Thinking:** As stated by Blindu (2020), "critical thinking not only develops the ability to identify other perspectives, but it

also develops the ability to control their own decisions and actions" (p. 25). Therefore, engineers of twenty-first-century skills are required to demonstrate critical thinking skills, as there may arise complex situations and problems at the workplace. Accordingly, Lavy and Yadin (2013) have stated, "among non-technical capabilities, one may find strong analytical and critical thinking skills to thrive in a competitive global environment"(p. 416). In congruent with this, Caratozzolo et al. (2019) have emphasized the lack of critical thinking skills among the students of engineering. The authors have also mentioned that critical thinking "is currently required by international accrediting associations and employers and which even is a basic requirement to carry out daily activities successfully" (p. 2). Further, Caratozzolo et al. (2019) have suggested that with the help of scaffolding and Zone of Proximal Development in reading and writing tasks, the students' critical thinking can be improved. Kupriyanov et al. (2021) have researched the relationship between the metacognitive skills and critical thinking skills on acquiring the foreign language and proposed classroom activities to be administered in the foreign language, which can help the students in developing their knowledge in the target language along with critical thinking and metacognitive skills. Consequently, it is significant to understand the students' deficiency in critical thinking and it should be addressed with the specific critical thinking classroom instruction, and coursework development to meet the needs of the industry (Sola et al., 2017). Besides, Jakovljevic et al. (2006) have stated that the traditional classroom teaching will not be suitable to develop the thinking skills of the students, as it does not arouse the learner's awareness of reflection on the thinking process. On this account, the use of ICT tools in the classroom will be helpful for the teachers to assess the progress of students' critical thinking and also helps the students to self-evaluate their progress.

3. **Communication:** Communication skills are cardinal skills not only for engineers but also for other professionals to convey their thoughts to the receivers with brevity and clarity. Correspondingly, Gribble (2014) has studied the employability in China, Vietnam, Indonesia, and India and has identified that communication skills and interpersonal skills are more vital amidst the cultural difference in the students' employability. Further, Neely and Michael (2018) have identified that effective communication is lacking among

today's workforce and recommend fostering the communication skills of the workforce, which in turn can increase the productivity of an organization. Therefore, communication skills can be determined to be the most crucial skill for the students of engineering to get placed in an organization. In this line, Gao (2019) has studied and identified that the project-based instruction method is a suitable method to implement and assess technical communication of the students of Engineering. Similarly, Pterovic and Pale (2021) has suggested that different approaches can be utilized to improve communication skills of students of engineering like "practical exercises, game-based activities, team activities, participation in internship programs, as well as specific systems or methods to support the acquisition of presentation skills, rhetorical skills, or pitching" (p. 1). Saleh et al. (2019) have analysed and identified that the teaching-learning activities like organizing small discussion groups, basic computer application, industrial practitioners as guest lectures, group assignments, oral presentations, writing technical reports, role playing activities, project communication, and essay writing are very effective in developing students' communication skills. In addition, technological advancement has been providing opportunities for the students to develop their communication skills online. Moreover, teachers can administer ICT tools in the classroom like Kahoot, blogging, video conferencing, CALL (Computer Assisted Language Learning), and so forth to develop students' communication skills. On this account, this chapter briefly discusses the tools to improve communication skills of the students of Engineering by implying motivational strategies.

4. **Collaboration:** Dede (2009) refers to collaboration as, "the practice of working together to achieve a common goal. It is an increasingly important educational outcome because organizations and businesses have increasingly moved to a team-based work environment" (Pardede, 2020, p. 3). Azizan et al. (2018) have proposed cooperative learning to develop students' collaboration skills and creativity by administering board games with technical based questions. In order to teach collaboration, Fajrina et al. (2020) suggest that during the "learning process teachers should create a situation where students can group for a team work, that will create a democratic atmosphere where students can [appreciate difference of opinion, realize the mistake they made, and can foster a sense of

responsibility in work responsibilities" (p. 99). St. Louis et al. (2021) have suggested that project-based learning can help in developing twenty-first-century skills with specific reference to problem solving, critical thinking, and collaboration. Steglich et al. (2021) have identified the impact of online education hackathon on fostering students' professional skills and collaboration skills. The authors have also analysed the strategies adopted by the students participating in the hackathon on collaboration, which helped to develop other skills like communication, initiative, and creativity. It is explicit from the above studies that collaboration skills can be developed among the students of engineering by cooperative learning, situation-based approach, project-based learning, and online education, which can be made effective with the use of ICT tools like MS teams, Google Classroom, Kahoot, and so forth. Accordingly, the chapter proposes different ICT tools to foster students' collaboration skills with the help of motivational strategies.

USE of ICT Tools in Developing Twenty-First-Century Skills

ICT tools have become an integral part of online education in the twenty-first century. Since the education has taken the transformation from traditional classroom to the digital classroom, ICT tools have become very essential in the pedagogical aspects. It also paves a way for developing requisite skills set along with the academic and technical knowledge. For instance, creativity skills can be developed by indulging the students in online creative activities like podcasting, audio branding, blogging, writing interactive stories, and so forth. Similarly, each twenty-first-century skill can be developed using various ICT tools comprising assessment and evaluation features for monitoring the students' progress in learning. The major drawback in using ICT tools is students' involvement, as the online classroom has technical issues apart from restricting the teachers' direct face-to-face approach in the classroom. Though the online platform reduces the anxiety of the students to talk in front of a large number of people in the physical classroom, it also reduces the students' interest in facing people. The anxiety of students is reflected in students' video performance in the online classroom. Motivational strategies will help the teachers to overcome obstacles like students' non-involvement, anxiety,

disinterest, and so on, in their classroom teaching. Motivational strategies play a pivotal role in the teaching-learning process. Dornyei (2001) has enumerated an array of strategies to motivate students in the classroom and increase their learning ability. Consequently, they will help in enhancing the twenty-first-century skills of the students of engineering through ICT Tools.

Motivational Strategies and ICT Tools

The following Dornyei's (2001) motivational strategies are pertinent in helping the students develop twenty-first-century skills in their online classroom.

1. Group Cohesiveness
2. Expectancy of success
3. Goal orientedness
4. Stimulated learning

These strategies can be instrumental in improving the students' skills set in the twenty-first-century classroom. Consequently, students can habituate the requisite twenty-first-century skills to be successful in their future workplace.

1. **Group Cohesiveness:** Group cohesiveness is defined by Carron et al. (1998) as a "broad and dynamic process which is reflected in the tendency for a group to stick, bond together and remain united in the pursuit of its goals and institutional objectives" (as cited in Banwo et al., 2015). It increases the commitment towards the members in the group. It helps the teachers to develop twenty-first-century skills among the students in small group tasks. Students can gain real-world application of their skills in group cohesion. Dornyei (2001) has suggested tasks like pair work, small group work, role-play and project work to increase the proximity, contact and interaction within the group in the online classroom. Similarly, to increase the cooperation between the group members, he has suggested: "role-play performances, problem-solving activities, project work, filling in worksheets, and preparing group reports-which require the preparation of a single 'group product'" (2001).

Microsoft Teams (MS Teams) is used as a digital workplace, which provides real-time communication between the people in an organization. In MS Teams, options for online virtual meetings, chats, sharing files, emojis, and so forth, are available that can help students to improve communication skills. It will help connect the people in the same organization and also provide features to collaborate with people from other organizations using Guest features which in turn can develop collaboration skills between different groups. MS teams have the option called breakout rooms. The teacher can separate the students into small groups and make them stay in different breakout rooms for discussion. The group tasks on real-world problem discussion, project discussion, role plays, and so forth can be conducted. Teachers can monitor all the students simultaneously. The video recording and chat saving options will provide the mapping of the students' approach. The teachers can also evaluate the students' progress by comparing their discussions in the breakout rooms. The final feedback can also be obtained from the students. In this line, both communication and collaboration skills of the students can be improved with Dornyei's (2001) Group Cohesiveness strategy.

2. **Expectancy of Success:** Expectancy of success is the belief that one can obtain desired goals, solve problems, and commit to long-term career goals (Yong, 2010). As per expectancy-value theory, the expectancy of success and subjective task values are the factors that determine the students' achievement and related choices. John William Atkinson (1957) developed the Expectancy-value theory, and later Jacquelynne Eccles (1983) expanded it to the field of Education, which is used to understand adult learning (as cited in Wigfield, 1994). Expectancy of success is studied regarding self-concept and self-efficacy. It helps students to perceive difficult tasks as challenges rather than threats.

Dornyei has stated that teachers should prepare their students for challenging tasks and also guide them in completing them. They should explain 'success criteria' to the students (i.e., How the students can reach their desired target in their task performance). In the online Google Classroom, the expected criterion of the teacher is for his/her students to achieve the target success in the given task which will be pre-displayed before commencing the tasks.

Dornyei (2001) has suggested different methods to achieve 'heightened success expectations,' like providing sufficient preparations through pre-task activities, assisting students in completing the task, letting students help each other in collaborative task completion, making the success criteria as comprehensible as possible, modelling success by live demonstration of students who succeed in the given task, and considering removing potential obstacles. In concordance with this, pre-task activities, collaboration, and live demonstration can be provided through ICT tools like *YouTube* videos, mind mapping tools like *Mindmup* and *Canva*, Google documents, Microsoft Outlook, *Sharepoint* app, and so forth. The obstacles in the learning ability of the students can also be pre-analysed using this strategy, which will help the students and teachers to develop their skills set. Further, understanding and analysing the situation-based tasks will help in improving critical thinking and creative thinking skills of the students of engineering.

3. **Goal orientedness:** Goal orientedness is conceptualized in different ways. It defines *why* and *how* people are trying to achieve various objectives (Kaplan & Maehr, 2006). Downson and McInerney (2001) have conceptualized goal orientation as, "the different ways an individual may adopt in pursuing goals and the competence in achievement situations" (as cited in Ong, 2014). Trichotomous framework developed by Elliot and Church (1997) has divided goal orientation into three dimensions namely mastery, performance-approach and performance-avoidance goal orientation.

Dornyei has suggested teachers instigate learners' goal orientedness by setting a common class goal. Students of Engineering will learn to meet the deadlines for their work by setting a common goal and working towards the target. Further, Dornyei has asked to consider individual goals, institutional constraints, and success criteria during goal-setting. Dornyei has further opined that the main aim of goal setting is "to show students to break down the tasks and assignments into small steps, how to assign deadlines to these and how to monitor their own progress." It will result in self-analysis of students' learning process. McCombs and Pope (1994) have provided a template for students with seven steps for goal-setting which include, problem solving and evaluating the progress. It is evident from these statements that goal orientedness plays a crucial role in the twenty-first-century classroom (as cited in Dornyei, 2001).

Hot Potatoes is a free software that includes six applications enabling teachers to assess the students by creating interactive multiple-choice questions, short answer questions, jumbled sentences, crosswords, matching/ordering, and gap-filling exercises. It is primarily created to improve the language skills of the students. But its applications pave the way to be used for all subjects. Similarly, Kahoot is an online platform, where teachers can create quizzes and games with visual effects. Kahoot provides pre-installed images, short videos, and pre-built question types. It is a commonly used tool to make the learning fun by its game-based learning technology.

Briefly, Kahoot and Hot Potatoes software have provided game-oriented quizzes and learning activities for the teachers to integrate in their online teaching. These platforms will fix the target common for all the students, who are participating in the learning activities. It will provide fun along with creating a competitive environment for reaching the goal first. The points secured by the students will be based on the correct understanding of the questions and providing solutions as fast as they can. It will increase their thinking ability, which in turn develop their critical and creative thinking skills. Similarly, in MS Teams, there are self-assessment polls, quizzes, and assignments; wherein the students have to provide the answers and check whether their answers are co-relating with their classmates. In this way, all the students will get the opportunity to respond in the class, besides encouraging the students' engagement in the teaching-learning process. Hence, by implementing goal-oriented strategies in the ICT tools, teachers can develop the four Cs of the students of engineering.

4. **Stimulated Learning:** Stimulated learning facilitates the learning process in a sustained environment. Visuals, hands-on activities, multi-model tasks, questioning tasks, and exciting tasks are some of the strategies suggested by Amanda Wiesner-Groff (2022), ESOL coordinator for Saint Louis Public School District, to stimulate students' minds in the learning environment. Dornyei has suggested three strategies to make the learning more stimulating and enjoyable, such as breaking the monotony of learning, making the tasks more interesting, and increasing the students' involvement. She adds that these strategies can be overlapped, but when analysed deeply, each strategy plays a vital role in the learning process.

Breaking the Monotony of Learning

Monotonous learning can be broken by introducing variety in teaching and learning. There are also different aspects of learning which can be implemented in the online classroom. Dornyei (2001) advocates the use of linguistic focused tasks, language skills tasks, different channels of communication and tasks containing different organisational formats like whole-class task, group task or pair task. He suggests that teachers can use various presentation styles, introduce new learning materials, and involve students in interesting classroom activities. Short stimulating games can also be used in the classroom to break the monotony. For instance, PowerPoint creation tools like Prezi can be used to help the students apply creative knowledge in designing their content. Learning materials can be posted in Google Classroom or uploaded in the MS teams for students to access at any time. Involve students in discussion by providing short clips, games, and polls to increase the students' involvement and their critical thinking skills. Besides, it also helps the teachers to assess the students' understanding of the concepts being taught in the classroom.

Making the Tasks More Interesting

The tasks assigned to the students of engineering in the online classroom should have challenging elements, interesting content, novelty, and intriguing, exotic, fantasy, and personal elements in them. Teachers should create competitiveness among the students to make the task more interesting. Dornyei recommends tasks, such as, crosswords and puzzles. In MS Teams, teachers can provide links for crosswords and puzzles which enhance the students' critical thinking skills. Teachers can also display an image on the screen and ask the students to respond to their first impression on the image. This activity will acquaint the students with brainstorming techniques and improve their creativity skills. Teachers can make the students prepare newsletters, posters, radio programs, brochures, or pieces of artwork. Humour is also an important element to be used amidst the monotonous classroom teaching. So, short video clips on humour related to the concept can be displayed to the students. It also improves their critical thinking, communication and collaboration skills.

Increasing Student Involvement

Students' involvement in the classroom learning needs to be increased. In the twenty-first century, the importance of students' involvement has become a decisive factor in the language learning process to meet the requirements of the future workplace. Dornyei (2001) suggests teachers to create a learning situation, where students will be the active participants. Specific roles can be assigned to each student and personalised assignments can be given to them. The classroom discussions and interactive sessions will also increase the students' involvement. Moreover, breakout rooms in the MS Teams application will help the students to interact with a small number of people and will get more opportunity to express their point of view. Group discussions can also be conducted with the use of this tool. Similarly, the students will get an opportunity to listen to other group discussions and argumentation skills. In this line, the students can develop their four Cs of twenty-first-century skills set.

Pedagogical Approaches Adopted in Teaching Twenty-First-Century Skills Using ICT Tools

ICT tools have become an integral part of online teaching during the pandemic. After the lockdown has been lifted, the impact of online learning is still having a huge impact on education. Consequently, the awareness of salient features of ICT tools is critical to integrate the tasks-based teaching to develop twenty-first-century skills of the students in the online classroom. Accordingly, ICT tools like MS Teams and Google Classroom, the most prominently used digital platform of Online education in Tamil Nadu, India, can provide a better platform to integrate the tasks like role plays, live demonstrations, situation-based discussions, crossword puzzles, visual inference, video lectures, and polls. Apart from these, the tools like Prezi, Hot Potatoes, Kahoot, Mindmap, Canva, YouTube, and Sharepoint apps can be used to perform classroom activities like presentations, audiovisual learning, and game-based learning. The authors enlist the ICT tools that can be used for various tasks to develop twenty-first-century skills of the students of engineering in Table 14.1.

Table 14.1 Pedagogical approaches to develop twenty-first-century skills

S. no	Motivational strategies	Task based on strategies	ICT tools to be used	Skills developed
1	Group cohesiveness	Pair-work, small group work, role play, project-work, peer-evaluation, feedback, questioning	MS Teams, Google Classroom, Zoom, Google Meet, WebEx, Google spreadsheet and Google slides, Sharepoint apps, Prezi	Critical thinking, collaboration and communication
2	Expectancy of success	Pre-task activities, sample tasks, short clips, pre-class instructions, live demonstration, mind map, brainstorming	YouTube, Mindmap, Canva apps, Kahoot, Quizizz, Hot potatoes	Critical thinking and communication
3	Goal Orientedness	Game-based quizzes and polls, target-based project presentation, creative writing, self-analysis task	MS Teams, Hot Potatoes, Kahoot, Quizizz, Prezi, Sharepoint	Creativity and critical thinking
4	Breaking the monotony of learning	Whole-class task, group task, pair-work, short clips, quick games	Kahoot, Google form, MS Teams, Google Classroom, Hot Potatoes	Collaboration, and communication
5	Making the tasks more interesting	Crosswords, random puzzles, newsletters, posters presentations, radio clips, pieces of artwork	Eclipse crossword, social media like Facebook, Twitter & Instagram, Podcasts from Amazon Prime & Spotify apps, YouTube shorts	Creativity and critical thinking
6	Increasing student involvement	Personalised assignment, situational role-play, group discussion, teacher induced arguments/debate, peer-comments	MS Teams, Google Classroom, Zoom, WebEx	Creativity, critical thinking, collaboration and communication

Approaches

To implement group cohesiveness strategy, the students should be divided into possible groups, in which each group could have at least five members and the students should be asked to work on a given situation. For example, the students should be asked to imagine a situation like being trapped in the classroom situated in a deserted building without any network signal and electricity with their group members. And now, the students should think of creative ideas to escape from the room, and they can use anything inside the classroom to escape but should not break the glass windows or door. This task will improve the students' collaboration within their teammates. It also improves their creative thinking, as the students should be able to give a solution which does not coincide with other groups. Further, it also improves their critical thinking, as the students will analyse, negotiate and evaluate all the possible solutions to tackle the situation. With online video applications like MS Teams and WebEx, the teachers can harness the option of breakout room, in which the students can be divided into groups and assigned the problem-solving situation for discussion. The teacher can enter into each breakout room to monitor the discussion. After the discussion, the students will be called in for a common class group to share their ideas and gauge the discussions with their peers.

In order to achieve the expected outcome from the students, it is necessary for the teachers to explain the criteria of assessment on the assigned topic. To be precise, in order to prompt students to perform better in their task, the teacher should explain the components of expected performance. For instance, when the students are prepared to initiate their Group Discussion in the online platform, the teachers should first explain the techniques and strategies to be incorporated in the task. Then, the teacher should give sample ideas to use at the beginning, during and end of the group discussion task. Later, the teachers should inform the task criteria that the students will be assessed by loud voice, appropriate points or relevant comments to the content, uttering sentences without grammatical errors, employment of appropriate dictions, gestures, and so forth. Next, the teacher can play a demo video on the group discussion. Further, the teacher should give a topic and ask the students to note down the words that occur to their mind on the given topic and this can be done through ICT tools like *Mind Map* and *Canva* apps. The teacher should verify the words pointed down before imitating the task. This will reflect on the

students' performance, which would in turn motivate them to succeed in the task. This task can also engender the students to think critically on the words related to the topic and communicate the appropriate phrases precisely.

In addition, while teaching rhetorical devices of speech like ethos, pathos, and logos to the students through online mode, the teacher can post an advertisement video or image in the Kahoot/HotPotatoes/Google Form and ask the students to identify the rhetorical device used in the advertisement. Since the quiz is created in ICT tools like Kahoot, Quizizz, and so forth, the students' progress on each correct answer will be displayed on the teacher's screen with a leaderboard. The teacher can even share the screen with students in the online classroom to motivate the students to reach the target. As all the students will be interested in playing the game, the leading person will keep changing according to each correct answer and the time taken to provide the correct answer. At the end of the game, the teacher can analyse the students' comprehension level of the content and the students critical thinking ability to answer the questions. In this game-oriented task, the teacher is inducing goal-oriented motivational strategies to all the students involved in the game to reach the target. This in turn facilitates the students to manage their time, concentration, understanding and comprehension ability to reach their target. So, the students' creative and critical thinking abilities can be developed or enhanced in the due course.

The concentration level of the students in online teaching can vary according to their interest on the topic. If the lecture is monotonous, the students will be disinterested in the lecture. So, in-between the sessions, the teachers can play some short video clips to motivate the students to hold their attention. For example, if the lecture is about the non-verbal communication, instead of giving lectures on the conceptual part, the teachers can show videos from YouTube, where non-verbal cues play a major role in the communication process. The teachers can also conduct quick games playing a *dumb charade*, guessing the word through pictures, finding words with minimal clues, identifying the appropriate technique used in the video played in the classroom, and so on. The teachers can use Kahoot platform, YouTube video clips, Google Classroom/MS Teams for creating immediate response correspondingly. In the case of *dumb charades*, as the students need both the video and the audio, it can be conducted in MS Teams where the students' answers will be saved even after the session ends. On this account, the students can have an extended

communication in both oral and written format with respect to their mode of expression, collaborate with their team, and enhance their critical thinking abilities.

Congruently, to make the tasks more interesting for the students to learn, teachers can ask the students to solve crosswords, puzzles related to the topic, and so forth. Eclipse Crossword is an app in which the teachers can create personalized crosswords for free and make the students solve individually or collaboratively with their peers. The teacher will be able to monitor the participants' progress through this ICT tool. Besides, the students can be asked to present the newsletter or posters or news articles taken from social media in the online classroom. In this line, the students will be guided to critically analyse the information and draw a creative output on delivering the learned knowledge.

Moreover, the teacher can also provide a situation like an election campaign and ask the students to perform as a group to deliver the speech with rhetorical devices. For example, one group can use ethos, the next group can use pathos and the third group can use logos. Additionally, teachers can induce situational role-play tasks as each student in the group will take a role in the campaign speech. In this line, involving students in the classroom tasks can help them collaborate with other students in their group, communicate their thought process, critically analyse other group members' perspectives on delivering speech/content and thinking creatively to integrate the topic given to them in their task. Comparatively, students will be more inclined to speak in an online platform rather than a physical classroom, as they can seek reference from the internet and teachers' guidance without any inhibition in preparing for their classroom tasks.

As discussed earlier, to improve the four Cs of the students, tasks like game-based quizzes and polls, target-based project presentation, creative writing, self-analysis task crosswords, random puzzles, newsletters, posters presentations, radio clips, pieces of artwork, personalized assignment, situational role-play, group discussion, teacher-induced arguments/debate, and peer-comments can be implemented in the digital classroom. Table 14.1 indicates the list of suggested tasks that can be integrated with ICT tools in order to develop the twenty-first-century skills of the students through the recommended motivational strategies.

This table is a sample proposal to integrate task-based teaching in the ICT tools by improving the students' twenty-first-century skills. The tasks should integrate motivational strategies to improve the students' involvement in the teaching-learning process. So, implementing motivational

tasks with ICT tools in the online classroom will facilitate the twenty-first-century skills of the students of engineering. Apart from the ICT tools specified in this chapter, the teachers can also consider providing assignments on video journalism, video dictionary, lexical podcasts, SMS podcasts, online surveys, and so forth. Moreover, the teachers can ask students to publish mini-projects in audio-visual/oral/written format based on their field of study which can develop their four Cs.

Conclusion and Recommendation

In this chapter, the use of ICT tools in developing twenty-first-century skills in the online classroom is discussed. Four Cs (Critical thinking, Communication, Collaboration and Creativity) are the most significant skills for the workplace preparedness of the students of engineering, which is the primal focus of this chapter. It has been explained that the ICT tools can help the teachers to develop these skills in the online teaching environment. It has also been perceived that the selected motivational strategies of Dornyei can help the teachers involve students' active participation in the teaching-learning process in the digital platform. The authors of this chapter explain how these strategies can effectuate the development of twenty-first-century skills through ICT tools among the students of engineering. Briefly, they conceptualize that integrating motivational task-based teaching with ICT tools can enable the teachers to identify the related tasks and ICT tools for fostering the twenty-first-century skills of the students of engineering by nurturing their workplace preparedness to meet the competitive edge of the current world of work. Further, the pedagogical approaches for the students of engineering in the chapter have focused the English language classroom tasks that can be implemented for other disciplines to motivate the students to take part in the digital classroom activities which in turn can prepare the students to meet the unforeseen challenges of the future workplace.

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Navigating Online Teaching in Asia: Innovations and Challenges During the COVID-19 Pandemic

Misty So-Sum Wai-Cook

This book includes a collection of reflections, conceptual chapters, and research chapters written by educators and researchers who were affected by the COVID-19 pandemic. Although online teaching and learning is not a new concept, many educators across Asia were challenged to leverage the technologies available to deliver online classes to replace the traditional forms of face-to-face and experiential teaching/learning. The pandemic has pushed us to think about the effectiveness of our teaching practices using a range of educational technologies, and rethink how we could transform the way we connect and engage students in learning as technologies continue to advance in the twenty-first century, in ways that we thought were not possible before the pandemic. The authors from Hong Kong SAR, India, Macau SAR, Malaysia, and Singapore shared

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their experiences in adopting a variety of frameworks, theories, and pedagogical approaches that they adopted to cope with online teaching in disciplines such as English Language, communication skills, community engagement, science, health, systems thinking, and students' mental well-being in online learning.

The four sections in this book deal with issues pertinent to online teaching in higher education during the pandemic: (1) Innovation in curriculum design and development; (2) Innovation in student engagement; (3) Innovation in assessment of students' learning; and (4) Innovation in the use of technology in the class.

Innovation in Curriculum Design and Development

The introductory chapter outlines the experiences of higher education instructors in Asia as they transitioned to online teaching during the COVID-19 pandemic. It also acknowledges the pre-existing emphasis on technology and innovation in Asian education systems and the significant growth of online learning in the region prior to the pandemic.

In Chap. 2, Lee shared that microlearning units could supplement traditional teaching to support students' learning of career planning skills in a scalable manner. She concluded that the future of learning should shift from a push paradigm where content is assigned to a pull paradigm where students have control over what, how and when they learn (Hamilton et al., 2021). Using Dolasinski and Reynold's (2020) microlearning model and Khan's e-learning framework (in Corbeil et al., 2021), Lee suggested that the design and development of the microlearning material should be performance focused, interactive, bite-sized, and scaffolded systematically in three segments: Readiness (an activity to prompt their prior knowledge), Discovery (the main content segment on the learning outcome) and Reinforcement (a quiz, which should be followed by feedback). The inclusion of gamification features such as progress tracking, and automated feedback could also increase students' motivation to engage with the learning materials (Polasek & Javorcik, 2019).

In Chap. 3, Sathasivam shared her autoethnography research on how she transitioned from traditional in-person to online teaching as reflected on students' positive feedback throughout her online course in Science Education. In this process, she emphasised the importance of being able to flexibly adjust her own teaching to accommodate her students' ability to learn in times of uncertainty. More specifically, she described her change-in-action in accordance with Guskey's (2002) Model of Educator

Change in four stages: change in situation (pandemic-induced shutdown: move to remote teaching), changes in lecturer's practices, changes in student learning outcomes, and changes in lecturer's attitude and beliefs. Although the content and the integrity of the course should not change regardless of the delivery mode, lecturers must be aware of the possible challenges that students encounter in distance learning and adjust their pedagogies to provide students with appropriate learning autonomy, the content is relatable and relevant to students, and students can reach adequate competency (Ryan & Deci, 2000).

In Chap. 4, Huang, Oon, and Benson proposed a need to adopt a more student-centric pedagogical approach to promote deep learning (Choi et al., 2019; Marín, 2020) in an Asian school system. They argued that, while it is difficult to change the traditional educator-fronted method of teaching in an Asian school system, it is possible to begin the changes when the lecturers' model how a student-centric pedagogical approach can be used to facilitate student learning, particularly for the pre-service and in-service educators who have the potential to lead the changes in schools in the future. Very positively, the authors found that the use of learner-centred pedagogy and use of technologies (e-portfolios) increased students' motivation, enhanced students' engagement, and promoted deep enduring understanding of knowledge. The authors of this chapter also highlighted the need for educators to encourage more self-directed learning, leverage on technologies to facilitate teaching and learning, and closely support students by giving them sufficient feedback on their work to increase their understanding and improve their work.

Innovation in Student Engagement

In Chap. 5, Sreenivasulu shared strategies to successfully overcome the challenges for both educators and students in online and hybrid classes conducted via Zoom. Sreenivasulu adopted the Technological Pedagogical Content and Knowledge Framework (TPACK, Koehler & Mishra, 2009) in his online classes on systems thinking, and suggested that educators must have sufficient technological, pedagogical, and content knowledge to be able to systematically scaffold concepts and create class/group activities to increase student engagement and promote higher order thinking and reasoning skills. He further proposed that, regardless of whether the lessons are conducted online, hybrid or face-to-face, educators play a critical role in student learning. Educators with sufficient content knowledge

can enhance students' knowledge and skills. Appropriate pedagogy can promote self-directed learning, increase student engagement, and create opportunities for students to collaborate. In addition, technologies such as the use of Zoom, e-whiteboards, and chat functions can create opportunities for discussions and provide platforms for collaborative peer interactions in small groups and receive feedback to reinforce their learning.

In Chap. 6, Ravindran, Lee, and Amini examined the shift from traditional face-to-face classrooms to online delivery mode in teaching of English as a Second Language (ESL) course. The authors shared that the instructors were not able to accommodate students' varying cognitive abilities and faced challenges such as students' inactivity, attention deficiency, and unresponsiveness when they shifted from face-to-face to online classes. However, despite the challenges in online teaching, educators must remain flexible to accommodate students' cognitive and social needs by planning of activities to enhance student learning, managing time well, and adjusting the pace of teaching to improve interactions in an online classroom. With these three considerations, educators will more likely be able to sustain students' enthusiasm and motivation for online learning and give them time and space to develop higher-order cognitive and critical thinking skills (Boling et al., 2012).

In Chap. 7, Xiong examined the Hong Kong university students' well-being in online learning during the pandemic, as well as their perceptions of environmental, technical, and pedagogical support from the university. Similar to the literature, students in this study reported they experienced physical challenges (Cao et al., 2020; Chandra, 2021), psychological difficulties (Carrillo & Flores, 2020), and poor living conditions which negatively impacted their learning. Xiong argued that universities and government authorities should support students' well-being by improving their learning environment and living conditions (Bisht et al., 2022). The author proposed that universities should provide timely and relevant professional development programs to equip educators with the necessary skills to prepare for emergency online teaching. At the course level, educators must accommodate students' well-being in online lessons by flexibly adjusting the pace and giving space for learners to cope with online lessons. The author ended the chapter by recommending educators to refer to both cultural and social cognition theories of change to better understand students challenges and best practices to nurture students in online lessons.

Innovation in Assessment of Students' Learning

In Chap. 8, Lim, Chua, Avnit, and Wang introduce innovative assessment practices they adopted at Singapore Institute of Technology. This chapter described the success of introducing more authentic, continuous assessments in the curriculum that align more closely to the learning outcomes and industry practices. This, in turn, also increased the validity of the assessments. The authors argued that the key to successfully replacing traditional methods of assessments (e.g., exams and quizzes) with authentic assessments is to ensure a good balance between the assessment loads for students and faculty and have sufficient time and opportunities to provide timely feedback (Oli & Olkaba, 2020; Watling & Ginsburg, 2018). However, policy makers must adopt an open, consultative, and progressive approach when they implement the changes in the curriculum. Very importantly, too, success of the implementations depends heavily on the team's effort, guided by thoughtful leadership, and regular conversations with the educators on the ground.

In Chap. 9, Mekala, Sangeetha, Harishree, and Geetha provided a framework for implementing twenty-first-century skills in online English courses for engineering students in India. In alignment with the Indian National Educational Policy 2020s (NEP, 2020), this chapter provides a framework that inculcates well-rounded individuals to thrive in the twenty-first century. The authors proposed a pedagogical framework that aims to teach students English proficiency skills and four essential twenty-first-century skills for engineers in accordance with the ATC21S framework—problem solving skills, ICT skills, communication skills, and collaboration skills beyond students learning requisite core domain engineering knowledge. Specifically, the authors thoughtfully proposed a series of tasks that could be used to facilitate the teaching of the 4 twenty-first-century skills, the assessment criteria for the twenty-first-century skills, and the expected skill-based and language-based outcomes. This task-based language teaching framework can be adopted across different local contexts in India and beyond, and across both STEM and non-STEM disciplines to promote the students' twenty-first-century skills and their English language proficiency.

In Chap. 10, Wai-Cook offered a conceptual framework for teaching and assessing empathy by utilising experiential learning in an online communication class. The author argued that like any module that involve community engagement, the teaching of empathy in a communication

class must include both academic rigour and experiential learning opportunities. It is only through working with stakeholders in the communities that students have the opportunities to apply the knowledge/theories that they learn in class, and challenge them to cross physical, social, emotional, cultural, or identity borders (Hayes & Cuban, 1996). Although it is best to teach communication and empathy in a face-to-face environment, students' reflections showed they were still able to link theory to practice when they analyse case studies and listen to speakers in an online environment. This can only be achieved if there is an appropriate balance between cognitive, instructor, and social presences in the online class.

Innovation in the Use of Technology in the Class

In Chap. 11, Bhati and Fink examined the impact of the pandemic on learning and teaching for college students at James Cook University in Singapore and Germany. The authors showed how they leveraged technologies to create a humane digital society with a self-managed, socialised digital landscape to foster digital citizenship (Fuchs, 2018; Wong et al., 2021). The digital platforms allowed colleagues to conduct academic conversations and share teaching practices in communities of practice (CoPs), and the e-collaborations allowed students to connect with academic staff to create and share ideas, communicate, and collaborate in CoPs.

In Chap. 12, Hall reflected on his experience as he transitioned from being an analogue to a digital educator. He advised educators to become "digitally extended" individuals (Parkinson et al., 2018), where they should leverage different e-platforms and utilise a range of tools for teaching and assessments, to move towards a more student-centric learning environment. In particular, he proposed that educators should use Kahoot, Mentimeter, Padlet, Quizzlet, and Slido to allow students to co-construct learning; and suggested that they should "mesh" a range of modalities in words, images, and audio in teaching to engage students in online lessons.

In Chap. 13, Firdaus and Shahid provided theoretical and practical guidelines for researchers and instructors to integrate the use of Telegram following a Community of Inquiry Framework in an online or blended-learning environment (Garrison, 2009; Garrison et al., 2010; Shea et al., 2012, 2014). The authors highlighted the importance of including social presence, cognitive, teaching presence, and learning presence in their Telegram-based community of inquiry (CoI). This will ensure students could be better engaged in the learning.

In Chap. 14, Mekala, Harishree, and Geetha highlighted the need to discuss how best to teach twenty-first-century skills to the engineering students, as employers consistently complained engineering students lacking twenty-first-century skills. The authors proposed a series of motivational strategies and tasks to inculcate four essential twenty-first-century skills, such as critical thinking, communication, collaboration, and creativity, to prepare engineering students for the workplace in India. They adopted a range of strategies such as group cohesiveness, expectancy of success, goal orientedness, and stimulated learning (Dornyei, 2001) to motivate students to participate in a range of thoughtfully designed task activities using a range of ICT tools.

Final Words

As a result of COVID-19, many educators around the globe have had to swiftly shift their teaching to online delivery mode. Connectivity due to technological constraints and sustaining students' engagement in learning online have posed challenges for educators in online teaching and learning in Asia. This collection of scholarly reflective practices as well as conceptual and research papers have provided the higher education academic community with insights on the educators' challenges, lessons learned, and best teaching practices in four key areas: innovation in curriculum design and development; innovation in student engagement; innovation in assessment of students' learning; and innovations in the use of technology in the class.

Therefore, it is hoped that this book can provide both educators and researchers in the academic community insights into how teachers from different regions in Asia across various disciplines have adopted different pedagogical approaches in their online classes to effectively facilitate teaching and learning in Asian higher education. Furthermore, the discussions raised in this volume should prompt educators to think about how they could more effectively teach, assess, and engage students as we leverage different technologies to design tasks in a mix of online, hybrid, and face-to-face teaching modes in the twenty-first century.

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