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Technology and education. Innovation and hindrances

Guest Editors

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Editorial 5(SI1): Technology and education: Innovation or hindrance?

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The pandemic-era experiences and outcomes, especially the ones related to new technology use (e.g. remote learning, teaching and working, telehealth), are here to stay (Cetrulo, 2021; Rapanta et al., 2021; Wilson et al., 2021; Bakken, 2020; Jabbari & Rezaei, 2020). We are in the process of learning to live with this 'new normal', constantly trying to improve the initial emergency circumstances we were exposed to (Ferri et al., 2020; Mitra Channa, 2020). Online Learning and Teaching (OLT) is no longer considered an emergency remote teaching (ERT) practice, but is now an activity that has become part and parcel of our everyday life. At present, we are ready to adapt, innovate, share and learn new practices, especially based on technological innovation activities and behaviors. Of course, we should also bear in mind that although innovation is particularly associated with advances in technology, technological innovations need a strong theoretical foundation, a systematic purposeful approach and a grounded theory in pedagogy (Serdyukov, 2017). Additionally, it is true that innovation in education is not only about technology, but also about solving real problems in order to promote equity and improve learning around the world (UNICEF, 2021), wherever possible.

Researches worldwide show that technology and innovative practices can improve the educational experience (e.g. Gunasekara et al., 2021; O'Brien, 2020; Shelley, 2020; Qing & Diamantidaki, 2020; Bonk et al., 2020). We continue to seek alternatives to traditional communication, knowing that the world we live in will never be the same again (Kefalaki & Diamantidaki, 2021), yet we need to acknowledge that this technological advancement is not applicable in all parts of the world where access to technology is not always possible due to socioeconomic conditions. This special issue will explore the successes with technology and its challenges to allow us to reflect on its use and purposes.

We caution against a deterministic concept of educational technology that naively looks at it from a perspective of an ever-progressing 'bigger, faster, better'. In innovation theory, various types of innovation have been differentiated: the four P's – product, process, position and paradigm innovations (Bessant & Tidd, 2015) – radical vs. incremental and systems vs. component innovation (Bessant & Tidd, 2015), disruptive (Christensen, 1997), open (Chesbrough, 2003) and reverse innovations (Govindarajan & Euchner, 2012). All these concepts can be applied to education – for instance, the inauguration of OA (open access) journals such as the Journal of Applied Learning & Teaching constituted an open innovation in journal publishing, and especially the original Canadian, connectivist Massive Open Online Courses (MOOCs) provide another key example for open innovation (Siemens et al., 2020). UNICEF (n.d.) conceptualises innovations in education as those of partnerships, programmes, processes, products and services.

In the history of educational technology (EdTech), "many technological innovations have been supposed to be 'the end of traditional-education-as-we-know-it' – a euphoric, and rather irrational, infatuation with technology" (Rudolph, 2018, p. 35). Illustrated texts, film, radio, television, computers, the Internet, mobile technologies and social media have been heralded as revolutionizing learning and teaching (Terzian, 2019). However, it would appear that throughout the history of educational technology, there was frequently insufficient consideration for how educators implemented, and students interacted with, such resources. Not knowing the history of educational technologies may condemn us to repeat the same mistakes all over again. We may not have to go as far back as prehistoric cave paintings (that may well be the "earliest examples of educational media") or to illustrated textbooks such as Comenius's 17th-century *Orbis Pictus*, a visual aid text for teaching Latin and the sciences (Terzian, 2019, p. 555). However, to avoid an ahistorical perspective on educational innovations and

technologies, it is instructive to choose some examples of innovations from the last two centuries. Due to the spatial confines of this editorial, a few key examples that show the typically uncritical narratives of progress that perceive technology as a cure-all must suffice.

Sir Isaac Pitman's correspondence courses in shorthand in 1840s England may be the earliest example of distance education (Terzian, 2019), and in 1885, it was erroneously predicted "that mail-correspondence students would soon outnumber students on campuses" (Rollins, 2014). In 1913, nobody less than serial inventor Thomas Edison was so enamoured by motion pictures that he audaciously predicted that "[b]ooks will soon be obsolete in the schools. Scholars will soon be instructed through the eye. It is possible to teach every branch of human knowledge with the motion picture" (cited in Terzian, 2019, p. 557). Edison was also wrong when he predicted that "[o]ur school system will be completely changed in ten years" (Edison, 1913, cited in Terzian, 2019, p. 557). In fact, Ferster (2014, p. 1) remarked that despite machines having radically transformed many aspects of daily living in the 20th century, "a nineteenth century visitor would feel quite at home in a modern classroom". The traditional learning environment in physical classrooms may have remained fundamentally unaltered.

Early educational films were overly focused on content and lacked a sophisticated instructional design. Frequently costly educational films were in low demand and overall, "the impact of films on education proved to be modest" (Terzian, 2019, p. 557). When radio became a mass product, once again much hope was invested in it. In the late 1930s, radio was sometimes thought of as a 'Master Teacher' (Cook, 1938; Tyson, 1936).

> "Experts in given fields broadcast lessons for pupils within the many schoolrooms of the public school system, asking questions, suggesting readings, making assignments, and conducting tests. This mechanizes education and leaves the local teacher only the tasks of preparing for the broadcast and keeping order in the classroom" (Cook, 1938, 249-250).

After motion pictures and radio, the next technology to supposedly revolutionize education was television. U.S. President Lyndon Johnson characterized educational television as a "vital public resource to enrich our homes, to educate our families, and to provide assistance in our classrooms" (cited in Terzian, 2019, p. 559). Again there was the vision of exemplary teachers reaching out to millions of learners. However, results were once again modest (Terzian, 2019).

A parallel development was the advent of computers in education. An early example of computers in the classroom was Sidney Pressey's Automatic Teacher of the 1920s and 1930s. Unlike the mass education of the radio or the film projector, the Automatic Teacher was supposed to foster a more individualized classroom. The device posed multiple-choice questions, and in order to proceed, the student needed to get the answer eventually right. Alas, the Automatic Teacher was a commercial failure (Watters, 2021). After World War II, the relative inaccessibility of prohibitively expensive mainframe computers meant that related educational initiatives had a "negligible impact on classroom instruction" (Terzian, 2019, p. 560).

Eventually, networked, portable and accessible electronic computers incorporated many features from earlier educational media, boosted by the meteoric rise of the internet and online learning from the late 20th century onwards. However, during the dot-com era, online learning ventures created by universities and venture capitalists, largely went bust (Rollins, 2014).

What does this brief glance at EdTech history teach us? Hopes are often exaggerated and one should not overlook commercial interests that are at play. There is a certain inevitability behind the supposed teleology of EdTech – however, our brief glance at history shows more randomness than determinism. In an interview, learning science expert Bror Saxberg remarked: "Technology is neither good nor bad. Technology teaches nothing... Technology is just technology" (cited in Rudolph, 2014, p. 215). There is a long history of viewing technology as a panacea and "both technological determinism and Luddism should be avoided, with there not being any Magister ex machina miracle" (Rudolph, 2018, p. 35).

The Journal of Applied Learning & Teaching (JALT) is certainly not Luddite and has an educational technology (EdTech) section that has produced numerous articles on educational technologies such as Gnowbe, Google shared files, Kahoot, Mentimeter, Nearpod, Padlet, Zeetings, and Zoom (Burton, 2019; Harris, 2018; Rudolph, 2018; Shuker & Burton, 2021; Stafford, 2020a; 2020b; 2021; Yeo, 2019). When browsing through past JALT issues, it could be argued that approximately every second article has technological or innovative aspects. More recent examples include Akinola et al. (2020) on virtual reality and education, Sim's (2021) evaluation whether we use Learning Management Systems correctly and Or & Chapman's (2022) review of online assessment approaches. The pandemic compelled higher education in developed economies to move to emergency remote teaching and eventually to more thoroughly considered approaches of online education (Alterri et al., 2020; Butler-Henderson et al., 2020; 2021; Crawford et al., 2020; Kefalaki & Karanicolas, 2020; Maddumapatabandi & Gamage, 2020; Mulrooney & Kelly, 2020; Hawley et al., 2021; Grafton et al., 2021; Mshigeni et al., 2021). At the same time, it is important to note that learning and teaching in less developed economies such as, for instance, Bangladesh (Shuchi et al., 2021), Cambodia, India (Teo & Divakar, 2021), Mozambique (Martins et al., 2021) and Uganda (Omona, 2021) face resource constraints in terms of constant electricity supply, access to digital devices and the internet. Lymperis (2019; 2021) in her research on marginalised rural schools in Greece shows that such constraints may even exist in EU member states.

As a result, this issue aims to examine the successes and challenges with technology in diverse educational settings, hence portraying its possibilities, but also its inevitable constraints. The decision rests with our readers whether

technology in education is an innovation or indeed a hindrance. The articles brought together in this special issue come from six countries in five continents (Australia, Canada, Nigeria, Singapore, the UK and the U.S.) and showcase process and product innovations as well as the pros and cons of the paradigm innovation of online learning.

Specifically, the first two articles in this special issue by Koulaxi & Kong and Déri show process innovations in the form of virtual writing groups (using Zoom) and academic writing retreats. The next two articles by Shuford Mayeaux & Olivier and Luo discuss product innovations, using YouTube and other platforms to build professional learning communities as well as a mobile app for learning Mandarin Chinese. Sanni et al. show the limits of a paradigm innovation such as online education in the Global South (Nigeria), when necessary preconditions for that innovation such as electricity, devices and Internet access are often lacking, while Kwan highlights academic burnout as an additional downside of online learning, even when such preconditions are given in a highly developed economy such as Singapore. Finally, the seventh article by Tan et al. shows that the switch to online learning in Singapore was located somewhere on a continuum between emergency remote teaching to andragogical innovation, depending on the various institutional environments as well as the time horizon.

The majority of the articles in this special issue of the Journal of Applied Learning & Teaching were presented at one of the events organized by the Communication Institute of Greece, especially the 2nd International Conference on Education (EDU2021). The first paper, by Afroditi-Maria Koulaxi and Jessica Kong (UK), entitled "Re-thinking virtual writing retreats in the COVID-19 higher education environment", explores the role of virtual writing retreats in supporting postgraduate students and enhancing the quality of their learning experience in the COVID-19 higher education environment. The authors explore virtual writing retreats as a way to (a) build a community, (b) create a virtual library, (c) combat isolation, and (d) maintain productivity, in a context of crisis. This study offers insights into the possibility and contribution of virtual writing retreats, also for Master students, and responds to specific challenges that arise from the context of a pandemic. The authors believe that the model and practice of virtual writing retreats could be considered by all educators regardless of their position in academia (researchers, Master and Ph.D students, professors, etc.). Additionally, as compared to physical retreats, virtual writing retreats are relatively flexible in terms of time and space and give the possibility for community building and academic productivity, especially for distance learning.

Catherine E. Déri (Canada) is the author of the second paper of this issue, entitled "Social learning theory and academic writing in graduate studies". Her paper aims to provide a greater understanding of peer learning in academic writing groups organized by graduate students in Canada (Master and PhD students). This study uses the social learning theory developed by Bandura (1971) with its self-efficacy concept at the forefront of the theoretical framework. In that regard, as the author explains, Canadian students can develop confidence in their abilities to successfully complete writing projects based on four sources of influence: mastery experiences; vicarious experiences; social persuasion; and physiological and emotional states (Bandura, 2019). This article proposes valuable strategies to develop academic writing competencies through social actions led by graduate students. The implementation of such initiatives, as Déri explains, in conjunction with institutional support, is recommended to increase successful outcomes for success to graduate, among others.

"Professional kinship using social media tools: Bridging and bonding to develop teacher expertise" is the title of our third research article, authored by Amanda Shuford Mayeaux and Dianne Olivier (USA). Their collective case study research provides information on the impact school culture, internal factors, and the state of flow have upon motivating a teacher to develop teaching expertise. The fact that expert teachers bond with peers within their school, but also bridge with peers outside of their school with the use of various social media tools from YouTube to professional learning networks on Twitter, has allowed experts to develop professional kinship and enhance their practice regardless of location and proximity with peers within their professional learning community. These major findings hold implications for theory, practice, and future research, particularly in terms of teaching quality and a change of mindset towards the profession and the standards of education.

"Novel micro-learning-based mobile-assisted language app for Mandarin Chinese» is the fourth article of this issue, authored by Ling Luo (China). This article discusses the original design of a mobile app (Android and iOS) as a supplementary tool for learning Mandarin Chinese, using micro-learning theory. This app promises to help overcome the substantial challenges in learning Mandarin. The author explains that by piloting the app and conducting experiments within a basic Chinese language course in a community college in Manhattan, the creators aim to assess the effectiveness of the proposed app free of charge. Additionally, Ling Luo explains that this app can be modified for learning other languages.

The fifth article of this issue, entitled "Knowledge and uptake of e-learning among Nigerian students during the COVID-19 lockdown" by Felix Sanni and co-authors (Nigeria) evaluates the uptake of e-learning among students of a local government area in Nigeria during a COVID-19 lockdown. The authors conducted a descriptive cross-sectional survey of primary and secondary school students that was conducted from January to February 2021. This article is important as it refers to the complexity of using e-learning practices in Nigeria (representing the Global South) that faces entirely different difficulties as compared to more advanced economies.

The sixth and seventh contributions bring us to the higher education landscape of the city-state of Singapore. James Kwan's study examines "Academic burnout, resilience level, and campus connectedness among undergraduate students during the Covid-19 pandemic. Evidence from Singapore". Kwan's findings show that overall, respondents had a moderate level of academic burnout, a high level of academic resilience, and campus connectedness. In Kwan's view, higher education institutions may wish to consider

redesigning the assessment structure to support a blended learning environment and provide additional support to students facing academic burnout and undue stress from the pandemic.

The seventh and final article, "Emergency remote teaching or andragogical innovation? Higher education in Singapore during the COVID-19 pandemic", is a collaboration between authors located in Singapore (Shannon Tan and Jürgen Rudolph) and in Australia (Joey Crawford and Kerryn Butler-Henderson). The paper provides a critical case study and reflection-in-action of the Singaporean intraperiod response, exploring individual responses from a sample of six autonomous universities, two international universities with campuses in Singapore, and four Private Education Institutions. The authors chose to ensure full coverage of the city-state to enable a comprehensive country analysis in contrast to the growing volume of single-institution case studies. They discuss how a regrettable technical focus has practical and research implications, and how research and university teaching and learning practice can better respond to future challenges through reflection of a sociotechnical perspective.

Despite its horrors, the current crisis may well present us with a well-disguised opportunity to improve learning and teaching experiences. The pandemic has offered us the need to bridge many gaps in our education systems, and technological innovation has the potential to help us address them. Of course, miracles cannot happen overnight; we cannot resolve long-standing problems and inequalities in the space of a few months or even years. However, this pandemic has provided us with an opportunity to see and understand our mistakes and transform them, with the help of technological innovations, among other things. We owe it to the young generation, that of our students and our children, to show the way and make this world a better place, sharing good practices and examples.

Acknowledgement

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Re-thinking virtual writing retreats in the Covid-19 higher education environment

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Abstract

This paper aims to explore the role of virtual writing retreats in supporting postgraduate students and enhancing the quality of their learning experience in the COVID-19 higher education environment. Besides treating the writing retreats as sessions exclusively organized to foster writing productivity for established academics and doctoral students, the first lockdown in April 2020 demonstrated the various ways in which virtual writing retreats can support postgraduate students. The discussion draws on a five-month intense (auto-)ethnographic work involving 15 Master's full-time students and Graduate Teaching Assistants from the London School of Economics and Political Science (United Kingdom). From April to September 2020, we ran 44 writing retreats on Zoom for a total of 352 hours. Responding to concepts of community of practice, social support, productivity and isolation/alienation, we have explored virtual writing retreats as a way to: 1) build a community, 2) create a virtual library, 3) combat isolation, and last but not least, 4) maintain productivity, in a context of crisis (and beyond). According to qualitative feedback and online participant observation, virtual writing retreats can create communities and generate emotional support—something that has fostered student communication and interaction despite physical distance and social constraints. Writing retreats can create a virtual library that helps maintain productivity, overcome writer's block and enhance students' learning experience. Based on this, we propose that the emotional support and productivity enhancement that emerged through and by virtual writing retreats, improve the quality of student learning experience—catering to both students' wellbeing and academic performance.

Introduction

The first lockdown in April 2020 due to the COVID-19 pandemic brought unprecedented challenges to students in the UK higher education environment. Especially, Master's students who usually come from various backgrounds across the globe and decide to pack up their lives and move to another country for a year, struggled significantly following the announcement to move all teaching online. Living in a 10m2 accommodation room has made students' life harder since leaving the familiarity of working on campus and at the library. Turning your kitchen table or even your legs into a desk is definitely a challenge, especially for those who engage in academic work. Given these complications, we ask the following question: How can educators assist postgraduate students maintain their productivity levels while building a community online during a pandemic? Virtual writing retreats were the answer.

In our capacity as Graduate Teaching Assistants at the London School of Economics and Political Science, we share our findings based on our initiative to run virtual writing retreats for our Master's students since the beginning of the first lockdown in March 2020. Inspired by existing literature on writing retreats in higher education, we will firstly synthesise ideas that address them as communities of practice, social support and writing productivity. Given the uncertainties that the COVID-19 pandemic has brought, we critically examine the usefulness of online writing retreats for postgraduate students in relation to the ethnographic study we conducted.

Academic writing: What is so difficult about it?

Existing higher education literature has addressed the hurdles of academic writing for both doctoral researchers and established academics (Murray, 2001). The individual nature of writing, lack of structure, time management and self-discipline alongside isolation are the most commonly reported challenges. Despite university initiatives that vary from one institution to another, academic writing is always associated with the aforementioned issues. Even though writing constitutes an integral element of PhD students and academics' everyday working reality, postgraduates struggle (Roberts, 2010) due to a lack of academic writing expertise (Murray, 2001). While most universities offer resources on practical skills for students' dissertations, there is limited support during the crucial period when there is the need for interaction and connection with peers. What happens when such existing obstacles are further exacerbated with the existence of a pandemic that demands social isolation and quarantine?

Possible solution: Writing retreats

Recently, writing retreats have been extensively employed as a solution to low (writing) productivity and present personal, professional and organisational benefits to participants (Kornhaber et al., 2016). According to Murray (2015, p. 57), "a writing retreat is an obvious way to make time and space for writing. It provides dedicated writing time". A writing or study retreat is a space where you can read, write, take notes or simply reflect on your work. Albeit possessing a different personal writing goal, retreat participants share the same collective goal—to boost their writing productivity and help one another achieve the general objective. Successful retreats are the ones that achieve to increase 'scientific publications output' (Tremblay-Wragg et al., 2021, p, 98). It is through collective practice of regular writing, peer review, and discussion that writing retreats could potentially contribute to helping both fresh and mature academics to construct their academic community.

Community of practice and social support

In higher education literature (Annala & Mäkinen, 2017; Ryan, 2015), by exploring students' participation in group projects, it is found that in the process, an individual student's thought, emotion, and action are aligned with the collective, which is theorized as a form of 'community of practice' (Wenger, 2011). Firstly, in terms of thoughts and meaning, albeit personal differences and discorded opinions, keen participants are aiming to reach their common objective of the assigned task. Based on a shared intention, students' expression and discussion are meaningfully surrounding a shared concern. They are able to connect with, and understand one another. Furthermore, from an experiential and emotional perspective, through participation, students are not only heading to the practical outcome of the task, but also co-creating a shared experience, thus allowing individuals to align with others in the collective and forge a community. Complemented by studies of social identity and collective identity in community studies (Wenger, 2011), when doing the same thing together, individual's concerns, actions, and feelings are identified with and connected to others of the same group. A we-community is forging, in which positive emotions of a collectivity, including sense of belongings, mutual support and dependence, and satisfaction are generated. And, dialectically, because of positive emotions of collectivity, participants found the experience of collective practice enjoyable, which has made them even more willing to help out one another in the we-community. As we can see, the notion of community of practice facilitates positive emotions, which are found to be experienced in the setting of communal studies in libraries.

Library studies and writing retreats as communities of practice

Retreats in higher education is a collective withdrawal from everyday routine for the purpose of writing productivity (Benvenuti, 2017; Castle & Keane, 2017). Aligned with its essence, studying in a library—retreating from business, and working with others with the same intent, in the same space, at the same time—also touches upon the notion of retreat and community building. In library studies (Bryant et al., 2009), it is found that the action of studying with other people in a library, who intend to stay focused, boost productivity, and perform the same behaviour with the physical presence of others, is a kind of community practice. The architectural and environmental setting of a library has strategically made a community of practice possible—as

actions of those studying in the library are shaped by the setting of the communal space. The adoption of sound-proof material, and the setting of independent, partitioned study areas, create a space for individuals to focus and study without distractions in silence. At the same time, given individuals' physical presence in the library, a sense of mutual accountability and collective presence emerge. Besides the silent study area, the social area of libraries allows individuals with a common goal to study, interact with peers, and take regular breaks. In the process, a study community evolves based on interaction and communal practice. According to studies (Nickel & Back, 2020), attending writing retreats in the physical space of a library allows academic faculty to enhance their writing productivity within a set time frame and build connections with their colleagues. In times of COVID-19, when libraries are not accessible, can online writing retreats reproduce the experience of library studies to facilitate MSc students' learning experience? Do writing retreats play an additional role, besides one that emphasises the importance of the 'time to write' (Morss & Murray, 2001)?

Isolation in pre- and during COVID-19 times

Informed by educational literature on student learning, our study draws on ideas of isolation and alienation in an attempt to address the challenges that students frequently face when entering an academic community with its own dynamics, and the feelings of alienation which sometimes accompany this process (Case, 2008; Mann, 2001; Peel, 2000). Peel (2000) has argued that first-year undergraduate students are "isolated learners", as they enter a different institution and find it difficult to create support networks with peers and teaching staff. Case (2008, p. 323) defines alienation as "a disconnection in the context of a desired expected relationship". As the focus is solely on Master's students, the 'fitting in' dimension that Case mentions is important for the current study. Limited teacher-student interaction (because of the time constraints and teaching staff commitments) can be interpreted as a characteristic example of why students feel alienated (Stephen et al., 2008).

Given the broader feelings of isolation reported due to lack of interaction with faculty, what has not been addressed yet is how the COVID-19 pandemic has exacerbated these feelings and in what ways can online writing retreats mitigate them. A survey conducted by Wonkhe and Trendence has shown that during Michaelmas Term in 2020, compared with Lent Term in 2019, "the proportion of students who felt lonely daily or weekly is much larger (50% compared with 39%), and a larger proportion of students do not feel part of the university community (50% compared with 40%)" (Office for National Statistics 2020). Also, based on interviews with thirty Asian college students, George and Thomas (2020) found that most students in the study were suffering from anxiety and depression in relation to social isolation and long-term quarantine during the lockdown.

In light of this, how could educators adjust approaches of writing retreats to mitigate students' loneliness and isolation?

What's missing?

Although existing literature has demonstrated the usefulness of offline writing retreats for academics and doctoral students, there has been less attention on the various roles exclusively online writing retreats play for international postgraduate students. Different from doctoral students and academics, MSc students have less experience doing independent research and dissertation writing, but are required to conduct a small-scale project; most of them were new to research processes such as reviewing literature, designing research methods, and analysing data. The idea for the online writing retreats emerged as, for the first time, students could relate to doctoral students, and started to experience the life of early career researchers: isolation while researching and writing. While previous studies on online learning platforms have investigated chat rooms and discussion forums as objects of study, they do not rely on interaction, structure, time management and collective participation (Mercieca & McDonald, 2021; Peeters & Pretorius, 2020).

Our study has a strong contextual dimension: while existing studies on writing retreats mainly focused on their offline (Castle, 2017; Singh, 2012), face-to-face nature, the COVID-19 pandemic presented international students with new challenges including alienation (Hall, 2020; Hu & Wang, 2022) and low productivity (Grant, 2006; MacLeod et al., 2012) alongside academic pressure, and personal and professional anxieties. Due to social distancing, online writing retreats shed light on a new exploratory angle that this study aims to contribute to. Besides treating the writing retreats as sessions exclusively for established academics and research students (Murray, 2001), our aim is to rethink their role in the hard-hit by COVID-19 Higher Education setting. To do so, methods of (auto-)ethnography and qualitative feedback analysis were adopted, which will be discussed in the next section.

Methodology

The discussion draws on a five-month intense (auto-) ethnographic work involving 15 MSc full-time international students and Graduate Teaching Assistants from the London School of Economics and Political Science (UK). Students' countries of origin included Hong Kong, Chile, Canada, Taiwan, China, Costa Rica, the United States, Italy, Nigeria, Azerbaijan and India – a sample that adds values to studies which approach intercultural education practices. The majority of participants consisted of female students: 12 female and only 3 male participants. Neither of the MSc students had attained an undergraduate degree in the UK higher education system. Three of them were mature students[1]. Half of the sample had not written a similar assignment (undergraduate dissertation) in their previous institution. It started as an initiative from the two Graduate Teaching Assistants and was promoted on various learning

1 According to UCAS, the term 'mature student' refers to anyone going to university or college after a period of time out of full-time education. See https://www.ucas.com/undergraduate/applying-university/mature-undergraduate-students#who-are-mature-students

platforms (such as Moodle), but was not formally introduced in the department or the School. We had the privilege of already knowing the majority of the students from seminars. This means that we had already met most of the students in the physical space of the university campus. The optional virtual retreats took place twice a week on Zoom, from 9:45am to 5:30pm with a two-hour long break in between. We ran 44 writing retreats from April to September 2020. Being very similar to the Pomodoro Style, our Virtual Writing Retreats followed this structure: 1) working on mute until the timer rings after 45 minutes, 2) taking a 10-minute break and then 3) repeating. The impact of the retreats was captured both during the actual sessions and through qualitative feedback received following their completion in September. We imported and analysed our fieldnotes and participants' qualitative feedback on Nvivo that generated the four themes.

Participants' feedback was obtained with the use of Qualtrics that included the number of times each student attended the sessions approximately, evaluation of the session and reasons for the respective evaluation, potential improvements for a future format, thoughts on formally introducing retreats in the Department and moments from the sessions they wanted to share. Although the request for qualitative feedback was sent to students after dissertation submission (when most of them were moving out from accommodations, went on holidays and travelling to reunite with family), nine out of 15 students responded. Students that filled in the evaluation form attended approximately 30 sessions which accounts for 68% (of all retreats). Since all data are based on writing retreat experience on Zoom, it is important to highlight certain features of the Zoom platform that are relevant to the effective running of online writing retreats.

Zoom

Firstly, from a visual perspective, like Longhurst's (2013, p. 44) study of Skype (video conference call software), Zoom projects the user's face on-screen, allowing users to view the "Self in the Box", which could be turned off and on according to the user's preference. Also, depending on selected display, the projection of other participants could be presented in gallery mode, meaning all faces presented in 'boxes' in a gallery mode; or the speaker's mode, meaning the speaker's face in a maximized window; or, a minimized version of the speaker's mode. This setting allows participants to visually present oneself, meanwhile seeing the faces of the speaker and other participants. Besides viewing, in terms of audio, users could choose to enable audio reception, and mute and un-mute their audio output. During the sessions or breaks, the chat facilitates interaction via instant messaging.

In short, these features of Zoom allow users to visually present themselves, and verbally communicate and semiotically interact with one another. Such affordances enhance interactivity and contribute to creating the experience of writing retreats, as we will discuss in the forthcoming section.

Results

Community building

When students were asked about the whole experience, a prevalent theme that emerged was that of community building, amidst challenges brought by the pandemic. As stated by Student 3 (2020), which was echoed by other students (Student 1, 2020; Student 2, 2020; Student 5, 2020; Student 7, 2020), "having experienced the weight of a pandemic and the process of completing a dissertation simultaneously was extremely difficult." Relating to the literature review, in times of a pandemic, international students were facing additional challenges because of social isolation and a sudden cut-off from accessible social support, which created "extra pressure" (Student 2, 2020) alongside their academic concerns.

However, responding to the concept of community of practice (Wenger, 2011), during the retreats students were able to communicate with others sharing the same social identity about their academic concerns, including deadline pressure, dissertation writing blocks, the difficulties of understanding certain concepts, and health uncertainties. In terms of understanding, they were able to realize that their individual concerns were, in fact, commonly shared among others. As Student 1 (2020) has put it,

> I didn't feel alone or left behind because I was able to hear other people's experiences and know that other people were experiencing the same things that I was experiencing (Student 1, 2020).

Because of an identification of commonalities in the process of communication, which was relatively limited in times of social distancing, students were able to relate to one another. According to them, when participating and discussing with others regularly in the retreats, "a family" (Student 1, 2019), and "a community of people" (Student 4, 2020) was formed, creating a sense of commonalities, togetherness, and social support:

> It was like a family or a community of people that I could relate with... I like the way we were willing to help one another to reach our goals, to offer support to one another... like sharing resources (Student 6, 2020).

In sum, by connecting socio-professional identities in a regular and consistent way, a special bond was developed in the group that brought students and facilitators closer to each other albeit physical distances.

A virtual library

Relating to the notion of the community of practice, students recalled the experience of writing retreats as studying at a 'virtual library'. According to the literature, a library is deliberately designed for individual studying, yet in the collective presence of one another. As the physical library was closed during the lockdown, students lost the option of studying in an appropriate working space. However,

according to students, virtual writing retreats recreated an ambient atmosphere that fostered concentration and motivation by enabling a quiet yet visual presence of other students. According to them:

> I usually study in the library and cherish that feeling of working in an environment where everyone is in the same mood, something that I lost during quarantine. But the retreats helped me to achieve that (Student 5, 2020).

> I really like the way we were 'watching' each other... there was a sense of presence, that you have to focus, and you can't look at your phone because others are watching you (Student 3, 2020).

> It is so different from working alone... I felt the time went much faster when I'm working with others in the retreats... I am way more focused and less drifted... I won't look at my phone or social media (Student 2, 2020).

According to the analysis of data, during the retreats students preferred retaining the visual display of other participants' faces (albeit on mute), which is a function enabled by the setting of Zoom. Being able to 'watch one another', the studying community becomes visible. The virtual visualization of the student body and the individual writing on mute generated a sense of collective presence resembling the atmosphere of the physical space of the library. In short, physically speaking, though working individually from their respective (student) hall/room the student was connecting to, and studying with, other participants at the same time and in the same virtual space. Therefore, writing retreats recreated the atmosphere of a library for collective and individual studying. Because of a sense of collectiveness, students reported that writing retreats also helped combat isolation, which will be discussed in the next subsection.

Combating isolation

The need to mitigate feelings of alienation and isolation mainly emerged from online participant observation and not so much from participants' feedback, feelings that the COVID-19 pandemic has exacerbated for all staff and students in this context. In line with existing literature that has frequently researched transition into higher education (Case, 2008; Mann, 2001), feelings of alienation were frequently reported, especially when it comes to largely individualistic goals such as researching and writing up.

For some of our regular students, the retreat time was the only social interaction they had during the day, as the majority lived in student accommodations or private halls. Others had moved with their parents in their home countries. According to Students 6, 9 and 15, they felt 'less isolated, alone, and disconnected', because people in the group can 'support and help one another' and 'engage in conversations' of 'what [has] made their lives easier in lockdown'. They were able to exchange numbers and finally meet as soon as the

lockdown was lifted. Based on our findings, the socialising dimension that was developed during the retreats reiterated the significance of the "informal, selective and spontaneous social structures" (Stroebaek 2013, p. 391) in the creation of student communities of coping in the fast-paced academic environment:

> When we are in the retreat, I never feel alone. All my flatmates were gone. I live on my own, but when we're all working together, I feel we're in this together (Student 7, 2020).

> We all have our cameras on. And suddenly, you're not alone in the room. You see so many faces and you think 'I'm not alone' (Student 10, 2020).

The gallery view on Zoom that showed participants in one screen was our participants' favourite setting. They were able to see everyone at the same time. During the breaks, students exchanged ideas on everyday things, such as cooking or movies:

> The sessions were really useful. I particularly liked the fact that there were breaks in-between to help us take a breath before continuing. The breaks gave us an opportunity to ask questions, share ideas, talk about our cooking, hobbies and to an extent keep company to one another (Student 13, 2020).

Not only did communication about academic and non-academic interests during a retreat mitigate loneliness intensified by the lockdown (Segrin & Domschke, 2011), but it also functioned as a wellbeing intervention (Eardley et al., 2021). By creating an online working space where students can connect and interact with their peers, feelings of alienation and isolation might be less likely to be experienced.

Maintaining productivity

Our findings showed that staying motivated and productive during the COVID-19 pandemic was undoubtedly a challenge for students who spent most of the time in their (student) halls or made efforts to catch up with their classes from the other side of the world. 'I am thankful for the caring and amiable atmosphere that helps me write my dissertation!', said a writing retreat participant. We observed, during that time, that our consistent, uninterrupted and prolonged writing retreats were effective in maintaining students' productivity where the campus experience was limited or, even absent (in cases where students were self-isolating or attended their classes from their home countries). The quotes below demonstrate in what ways the online writing retreat fostered an environment of writing productivity:

> When I was writing on my own, I could be drifted easily... I looked up my phone, checked on social media, went to check the fridge...etc., but when I'm working with others in the retreats, I can't explain it, everybody is working so I'm working as well... I am way more productive (Student 15, 2020).

> I set specific goals before the 45 minute session, like writing a plan for my literature review... I told myself that during that time I would just focus on that goal... We were all muted. I was very productive and was able to achieve my goals (Student 6, 2020)!

From the above quotes, it was evident that well-defined tasks, timed sessions and 'being watched' by peers and facilitators encouraged students to achieve their goals. What proved to be very beneficial to them was discussing their goals in an informal setting during the breaks, such as whether they needed to revise their goal, if the goal was overambitious, or how many tasks they could complete within the given time. The creation of a space that reproduced typical working conditions was what increased productivity and gave a clear structure to the day.

Conclusion

In conclusion, based on auto-ethnographic fieldnotes and qualitative feedback, and responding to concepts of community of practice, social support, productivity, and isolation/alienation, we have explored virtual writing retreats as a way to: 1) build a community, 2) create a virtual library, 3) combat isolation, and last but not least 4) maintain productivity, in a context of crisis.

Our study extended the notion of writing retreats in two ways. Firstly, as discussed, previous studies of writing retreats addressed researchers: doctoral candidates and academic faculty, but not Master's students. However, it is important to note that Master's students also need to fulfil writing demands and complete their dissertation following the completion of compulsory coursework. In terms of practice, educators in higher education might consider this model to construct a writing community, which develops academic well-being (Stevenson, 2020).

Also, previous studies of retreats were conducted based on physical settings. However, in times of pandemics, face-to-face interaction is no longer possible. This study offers insights into the possibility and contribution of virtual writing retreats, and responds to specific challenges that arise from the context of a pandemic. Regardless, we hope that the model and practice of virtual writing retreats could be considered by educators. Compared to physical retreats, virtual writing retreats are relatively flexible in terms of time and space and offer a space for community building and academic productivity, especially for distance learning.

Challenges and limitations

Although virtual writing retreats offered students opportunity for socialisation, productivity, and community-building, this experience cannot be treated as a panacea to the various challenges that the pandemic exposed to them. In fact, a twice-a-week retreat could not compete with teaching and community-building in a physical space, as the nature of casual interactions and university experience differs when students move from the offline to online space. The difficulty also lies in the facilitator if they have not established a relationship and rapport with participants; in our case, this relationship was pre-existing, but was further strengthened during the retreats given the temporal and social aspects of the retreat. We assume that such a method might only be suitable to self-motivated and high-performing students and/or students that aim to pursue an academic career in the future (i.e. students that are planning to conduct a doctoral thesis). This study does not suggest that online writing retreats fit all MSc students: it might not be appropriate for those less motivated or academically oriented. Therefore, the challenge for facilitators in the digital space of the platform is to engage and include those students who are not self-driven, less motivated, or silent. While these are initial assumptions, more research needs to be done to assess the effectiveness of online writing retreats in students' performance in assignments and dissertations. In addition to these challenges is Zoom fatigue which has become a widely recognised condition (Hall, 2020). Based on our own experience, it is not always easy to be the facilitator of an online writing retreat during the COVID-19 pandemic. Facilitators have to deal with their own anxiety and uncertainty for the future and it can be challenging to cater for every student's needs (as they may arise during a break, for example), but it is a rewarding experience for both parties. It should be noted that the popularity of online writing retreats can be attributed to the very specific temporal and contextual dimensions (unexpected lockdown and measures for social isolation), while in the post-pandemic times the retreats can work in a hybrid mode, which may entail a different learning experience. With the hybrid mode of teaching being more prominent in higher education environments, the role of online writing retreats and the limitations they entail should be given more scholarly attention to foster inclusion, community building, participation, productivity, and well-being.

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Social learning theory and academic writing in graduate studies

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Abstract

Over the past 20 years, the *Organization for Economic Co-operation and Development* has reported a median of 50% for dropout rates in doctoral programs, all disciplines combined (OECD, 2019). Among reasons for not graduating, PhD students identify a lack of experience and competencies with academic writing, impeding on their progression as students, but also as novice scholars (Litalien & Guay, 2015). Indeed, graduate students are required to undergo professional socialization, by engaging with other scholars, to learn the norms and practices of their respective research fields (Skakni, 2011). This paper aims at communicating preliminary results from a doctoral research to provide a greater understanding of peer learning in academic writing groups organized by Master's and PhD students. The social learning theory developed by Bandura (1971) is used as a foundation to our study, with its self-efficacy concept at the forefront of our theoretical framework. In that regard, PhD students can develop confidence in their abilities to successfully complete writing projects based on four sources of influence: mastery experiences; vicarious experiences; social persuasion; and physiological and emotional states (Bandura, 2019). While studying a learning community composed of 4,000 graduate students, as an instrumental case study (Stake, 1995), we conducted semi-structured interviews with 25 PhD students, followed by a content analysis of transcripts using a qualitative data analysis software (NVivo12). Participants representing 12 Canadian universities and 14 scholarly disciplines shared significant learning experiences related to all four self-efficacy sources of influence. Of particular interest, findings revealed that PhD students gathering in public places (cafes, libraries, coworking spaces, museums, parks) increased their self-efficacy through peer learning (exchanging, observing, modelling). These results are presented with a view of recommending valuable strategies to develop academic writing competencies through social actions led by graduate students, in conjunction with institutional support in the context of higher education.

Introduction

Over the past 20 years, the *Organization for Economic Co-operation and Development* has reported alarming dropout rates of 50% in doctoral studies, all disciplines combined (OECD, 2019). Among reasons for not completing study programs, PhD students identify actual or perceived deficiencies in writing abilities, which not only impede their progression as students, but also as novice scholars (Litalien & Guay, 2015). Since academic writing competencies are not necessarily taught in a deliberate fashion to graduate[1] students (Kapp, 2015), PhD students can suffer from the imposter syndrome, feeling like they do not possess the intellectual capabilities, in comparison to their peers, to successfully complete their study program (Burchelle-Reyes, 2021). Therefore, the professional socialization of graduate students is essential to help them learn the norms and practices of their respective research fields by engaging with other scholars (Skakni, 2011). As such, academic writing groups are recognized to facilitate the development of writing competencies, all the while, enhancing perseverance in graduate studies (Murray, 2015). More specifically, Ferguson (2009) asserts that dissertation writing groups formed exclusively of doctoral students offer practical and psychological advantages by reinvigorating productivity, resulting in increased motivation and self-confidence. This paper communicates results from an ongoing doctoral study on social learning in academic writing groups to provide a greater understanding of how PhD students develop writing self-efficacy.

Academic writing groups in higher education

The socialization of PhD students rests on a proactive posture consisting in developing strategies depending on individual interests, aptitudes, and circumstances (Vezina 2016). In that regard, a multitude of options exist for those who wish to join academic writing groups as a mean to progress their writing projects. The *writing retreats* represent an opportunity to disengage from everyday routine, by traveling to a location more or less isolated, where participants fully commit to intensive writing activities over a previously set period (Kornhaber et al., 2016; Murray & Newton, 2009). The *writing teams* are composed of experienced scholars and/or novice scholars meeting at regular intervals over a set period to write in a shared space and offer each other feedback on their respective written products (Aitchison, 2009). The *writing workshops* consist of professional development sessions during which participants receive guidance from an expert to improve their academic writing competencies (Larcombe et al., 2007). The *writing spaces* are physical environments set up to support academic writing activities where participants can go if they wish to benefit from optimal writing conditions (Pigg 2014). The *writing cafes* draw their name from existing businesses (serving hot beverages) in a region where participants invite each other to meet at proximity of

their residences to write at their convenience (Mewburn et al., 2014). The *digital writing platforms* offer opportunities for participants to collaborate online by means of virtual applications to integrate technology enthusiasts, individuals from remote locations or those unable to leave their homes to write in the presence of others (Beutel et al., 2010; Jolly et al., 2020). Irrespective of the selection, all academic writing groups are based on the same central perspective: writing is a social activity (Bruffee, 1986).

Social learning in PhD programs

The social learning theory was developed by Albert Bandura (1971), a Canadian psychologist interested in learning resulting from the observation of others and the consequences of their behaviors. When applied to an educative environment, this theory provides a foundation to explain how students develop the capacity to maximize effective behaviors leading to successful academic outcomes. Interested in performances related to academic writing, we chose a core concept inherent to the overarching theory, named *self-efficacy*, and defined by Huerta et al. (2017) as "the belief in one's capability (or confidence) to write in a given situation" (p. 171). With this definition in mind, PhD students can develop confidence in their abilities to successfully complete writing projects based on four sources of influence: mastery experiences; vicarious experiences; social persuasion; and physiological and emotional states (Bandura, 2019). In other words, students are more apt to reach their goals if they already succeeded at a task, if they witness someone else succeeding, if they are told by someone of significance that they possess the capability to succeed, or if they find themselves in physiological and emotional states conducive to success.

In regard to *mastery experiences*, they represent the source of information having the greater influence on the representation that an individual can make of self-efficacy (Bandura, 2003). Basically, an effective performance is not only dependent on one's knowledge of procedures and strategies to complete a task, but also on the individuals' assurance that they are the masters of their own actions (Flavell, 1970). For example, if a PhD student successfully published a first article in a peer-reviewed journal, this successful performance will boost their confidence to engage in other publication processes.

In the absence of previous experiences with a specific task, *vicarious experiences* are of particular importance (Takata & Takata, 1976). As such, students will develop self-efficacy by a social comparison of their capabilities with others having completed the same tasks under similar circumstances. Since academic writing is an isolated task in nature, it is more difficult to find occasions for comparisons, hence why academic writing groups represent a favourable environment. In a study conducted by Vincent et al. (2021), participants in academic writing groups gained confidence in their abilities after observing and modelling time management and goal setting techniques used by their peers effectively progressing writing projects.

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1 In Canada, the term "graduate" relates to study programs at the Master's and PhD levels. Therefore, the expression "graduate studies" is synonymous with "higher education" and "graduate students" include Master's and PhD students. PhD students who have completed a doctoral exam on knowledge acquired during their initial mandatory coursework will typically be called PhD candidates to reflect that they have initiated their doctoral research and dissertation work.

Furthermore, *social persuasion* reinforces self-efficacy if an individual expresses their trust in someone else's capability to successfully achieve a performance. However, the encouragements must come from a person of significance and the expectations must be realistic (Chambliss & Murray, 1979). Throughout PhD programs, students will receive regular feedback from their advisors or committee members, but also from editors of scholarly journals or research funding organizations. According to Kamler and Thomson (2008), PhD students feel apprehensive about critics on their work, which undermines their self-confidence. Therefore, receiving encouragements from peers, in a safe space like academic writing groups, is useful for PhD students to digest feedback in a purely formative manner.

Finally, *physiological* and *emotional states* represent the last source of information influencing self-efficacy in PhD students, especially in the achievement of a task requiring stress management. In a study by Tremblay-Wragg et al. (2020), the authors highlight the importance of selecting the right work environment to facilitate academic writing. In that respect, an optimal setting would have natural light coming in, be deprived of loud noises, be equipped with ergonomic furniture, and offer sustenance options. On the emotional front, Fullick (2021) stipulates that there is an increase in mental health issues experienced by PhD students, such as anxiety and depression. Therefore, Mitchell et al. (2017), propose the development of emotional intelligence as a strategy to enhance self-efficacy.

Methodology

Our research aims at reaching a better understanding of issues associated with the socialization of PhD students to become competent novice scholars by their participation in academic writing groups with their peers. However, this article only covers a portion of the data initially collected in order to focus on the development of self-efficacy by PhD students through social learning. As such, our goal is to understand the studied phenomenon from the representations and comments expressed by participants in our research, while adopting a socio-constructivist approach. Therefore, data collection and analysis methods adhere strictly to a qualitative perspective.

Our instrumental case study (Stake, 1995) is delimited by a learning community established by a non-profit organization that "specializes in creating physical and human environments to facilitate scientific writing" (Thèsez-vous, 2021). The community is composed of 4,000 graduate students engaged in a myriad of academic writing activities. These students come from Canadian universities offering study programs delivered in French, one of the two official languages in Canada. We recruited participants for our study by posting a message on the community Facebook page targeting PhD candidates who had completed their doctoral exam and partaken in academic writing groups on a minimum of three occasions to be able to share a variety of experiences.

We conducted semi-structured interviews averaging 60-90 minutes with 25 PhD candidates. In terms of demographics, the majority of participants identified to the female gender (female=23, male=1, and non-binary=1). Their average age was 34 years old and they originated from seven different countries (Canada=15, France=5, Belgium=1, Madagascar=1, Moldavia=1, and Algeria=1). They represented 12 Canadian universities and 14 scholarly disciplines, with Humanities and Social sciences (Education, Literature, Sociology, Psychology, Philosophy, Anthropology, Law, and Communications) prevailing over hard sciences (Medicine and Environmental Studies). At the time of the interviews, participants had invested an average of 6 years and 9 months in their doctoral program, thus they were able to share significant social learning experiences related to academic writing tasks.

The participants answered about twenty questions covering the aforementioned four sources of influence on self-efficacy: mastery experiences; vicarious experiences; social persuasion; and physiological and emotional states. Then, a content analysis of transcripts was done using a qualitative data analysis software (NVivo12). Data were categorized under three themes: the strategies of socialization to the scholar profession, the development of writing competencies during a PhD program, and the learning experiences materializing in the context of academic writing groups. The findings presented in the next section will focus on the last theme to highlight social learning experienced by PhD students engaged with their peers in academic writing activities.

Results

Our findings revealed that PhD candidates will increase their writing self-efficacy through social learning (exchanging, observing, modelling) when participating in academic writing groups. Since the data analyzed to produce these results were collected during the COVID-19 pandemic, participants to our study were asked to draw from past experiences. Although this may be considered a limiting factor in our study, Van der Maren (2010) considers that "when interviews require participants to invoke long term memory, the recollection does not restitute the past, but rather reconstruct the past based on the current recollection of the past with a view toward the future [translated]" (p. 132). As such, participants identified under pseudonyms below shared their respective experiences about when they used to organize academic writing activities with their peers in public places (cafes, libraries, coworking spaces, museums, parks). Even though we have also gathered their perspectives on virtual experiences with online academic writing groups, these results are not included on this article.

Mastery experiences

According to Bandura (2019), when students are convinced that they possess the capacity to succeed, they will both persevere in the face of adversity and bounce back more quickly from challenging situations. Therefore, successes contribute to increase self-efficacy, whereas failures will

reduce it, especially if these failures occur before the individual was able to develop beliefs in their capacity.

The findings to our study reveal that PhD candidates who gained experience with academic writing while completing a master's degree, were more confident with drafting similar types of documents during their doctoral studies. In that regard, Gabrielle mentioned that: "...early on during my Masters, I had the chance to be a member of research teams, therefore I prepared grant applications for myself, but also for a number of research projects [translated]." These previous experiences allow for PhD candidates to learn about the norms and practices of various academic writing processes.

Once admitted to their PhD programs, students can secure Research Assistant (RA) contracts that can also be formative, as they provide opportunities to gain experience with various academic writing tasks. When describing how she benefited from the supervision of professors during such contracts, Diane recognized: "in the capacity of RA, I acquired competencies. There were two professors, in particular, who taught me a lot by highlighting incoherencies in the way I was writing, and by providing me with tips to become more effective as a writer [translated]".

Additionally, mastery experiences can come from PhD students taking risks on their own, for example, by delivering communications in various scientific forums involving the submission of conference proceedings. Considering that the doctoral journey is an ideal time during which students should test their communication skills, Anabelle indicated: "We must practice expressing ourselves in public, even if we don't like it. Ultimately, practice makes perfect! The first time you may fail, but the second time will go better. Who knows, the first time may even go very well [translated]."

The development of self-efficacy can occur over time, with the improvement of performances once their outcomes stabilize. As long as the individual does not perceive reaching a plateau as a limit to personal capabilities, but rather consider it being a sign of mastering the actual task. Although the above examples of mastery experiences did not come from the participation in academic writing groups, they are key to PhD students gaining confidence in their writing abilities, then being able to model these successful behaviours for others to observe or replicate.

Vicarious experiences

The ultimate achievement during a PhD program remains the dissertation defence and even if it seems far down the road for some students, witnessing a peer reach this milestone can represent a vicarious experience. When describing the impact of attending one of her colleagues' defence, Olivia mentioned: "I needed that moment, to attend a dissertation defence of someone who was not 100% satisfied with what he had done, but still managed to complete the work. Then, I told myself: 'This could happen to me. I may defend my dissertation one day.' It gave me the energy to carry on [translated]." In this case, the participant was able to compare her capabilities to the ones of her colleague

because they were often participating in academic writing groups together.

On the contrary, witnessing peers struggling can also have an influence on self-efficacy, especially if it is assessed that it is in a comparable situation. Considering alarming dropout rates, Charlotte recognized: "...we see PhD students giving up, so obviously you tell yourself, if one person out of two drops out, why not me? I am not necessarily facing the most favorable conditions to succeed [translated]." Again, this statement was expressed by this participant recollecting the unfortunate situation of a peer she used to write in the company of, being aware of his personal circumstances that she considered to be similar to the challenges she was also facing with her writing projects.

Nevertheless, the normalisation of challenges faced by the majority of PhD students is essential to avoid the negative impact that adverse experiences can have on the entire doctoral journey. In that vein, while discussing the process of peer review when submitting a manuscript to scholarly journals for publication, Isabelle contrasted: "...in writing cafes, among friends, I hear someone say, for example, 'My article was rejected'...it is unfortunate, but it is not discouraging, because it happened to me as well, it happens all the time [translated]". Through shared experiences, PhD students can act as peer support by encouraging each other when facing comparable challenges, thus limiting the impact that unsuccessful performances can have on one's self-efficacy in the long term.

Social persuasion

When it comes to social persuasion, as previously mentioned, feedback must come from a person of significance to have an influence on self-efficacy. In the case of PhD students, it is usually other students who are further along in their study programs, as explained by Florence: "In general, I think that you can help others who have more experience than you do, but in my situation, I know that I benefited more from individuals who were ahead in their journey than the opposite [translated]."

Prior to submitting her first proposal for a communication in a scientific conference, Tania remembered receiving encouragement from a peer during an academic writing session: "When I was feeling insecure about my project and thought that communications were inaccessible to me... at the end, my proposal was accepted without any modification, but it is thanks to her that I dipped my toe in the water, if you will [translated]." In this example, the imminent nature of the task at hand may have played in favor of the participant being persuaded of her capacities to succeed, since she was able to visualize short term gains. As for Helen, her self-efficacy was enhanced by supporting one of her peers who was in the process of writing a scientific article: "I was encouraging him to use a metaphor in the introduction of his paper to hook readers in... he thought that it was a great idea... I felt good because it made me realize that I possess this talent...to offer advice on the work of others [translated]." This participant went as far as transposing this boost in self-efficacy to her future

employment opportunities, stating that realizing she was capable of advising her peers would make her a competent university professor.

Physiological and emotional states

The somatic information on which students will rely to evaluate their capacity to successfully complete tasks become indicators of performance, especially when reacting to demanding situations (Bandura, 2019). In this respect, physiological indicators may include breathing, muscular tension, perspiration, heart beats, and digestion. As for emotional indicators, individuals can assess their moods, fatigue, anxiety, excitement, focus, and concentration. All in all, it is a matter of knowing if what is being physically or emotionally experienced is unusual and can be controlled. According to our results, several PhD candidates are motivated by deadlines, when these targets become positive stressors, as described by Lucie: "In general, I work a lot better under pressure, so I will progress my work significantly if I have a meeting with my advisor or a deadline for an article or the faculty informs me that I must submit before a set date [translated]". In the context of academic writing groups, participants to our study mentioned developing connexions with peers leading to collaborative work, such as co-authoring scientific articles, also implicating deadlines required to be collectively met.

Unfortunately, with an increased number of graduate students suffering from mental health issues, regulating their situation to continue feeling that they are up to the task is essential to avoid falling into the trap of doubting one's capabilities. Facing this unfortunate situation, Roxanne explained that: "This year, I had issues with my medication, therefore it became my priority to resolve this situation… because it greatly changed the way I was seeing things or the way I was functioning [translated]". Considering how demanding PhD programs can be, being in optimal physical or mental health can make a difference with successfully advancing writing projects.

When realizing that her peers experienced similar challenges with academic writing, even though they seem to be progressing well from the outside looking in, Elizabeth stated: "It allowed me to temper my performance anxiety, and focus on enriching the content under development, instead of obsessing over the time that it was taking me to complete the work [translated]." PhD students are recognized to have perfectionist tendencies that will skew their perception of quality work and, by the same token, their required capabilities to achieve unreasonable standards (Single, 2010).

As previously described, there are many other physical or emotional factors that come into play when discussing PhD student's self-efficacy. In order to limit the length of this paper, we focused on presenting results related to physical and mental health, stress, and anxiety that predominantly surfaced from our data analysis.

Conclusions

Throughout their journey, PhD students benefit from multiplying interactions with other novice and seasoned scholars, since doctoral programs constitute an opportunity for socialization to the scholar profession. According to Kornhaber et al. (2016), the combination of collective and reflexive experiences facilitate the integration of academic writing norms and practices. Therefore, academic writing groups offer developmental experiences, both formal and informal, contributing to the professionalization of PhD students wishing to belong to the world of academia (Rickard et al., 2009). As for Murray and Newton (2009), they explain that constructive exchanges taking place between members of academic writing groups represent invaluable support for participants facing common challenges within a community. In this regard, minority groups that remain disadvantaged in terms of professional opportunities, such as women working in certain fields of research, seem particularly drawn to these developmental strategies for networking (Faulconer, 2010; Wollast et al., 2018). Since the majority of our participants identified to the female gender, our research findings provide a greater understanding of how women learn from each other to become competent scholars.

Social learning between peers that is occurring in academic writing groups contributes to enhancing self-efficacy in PhD students by providing them mastery experiences and vicariant experiences, as well as opportunities for social persuasion in environments favourable to physical and emotional states. PhD students with enhanced self-efficacy will be able to tackle academic writing projects of increasing difficulty henceforth perceiving these tasks as interesting challenges. It is also expected that with greater self-confidence, PhD students will approach writing projects with a collaborative perspective, not always feeling as if they must prove themselves in relation to their peers, which in turn should temper the unhealthy competitiveness of graduate studies.

Overall, this article presented findings with a view of recommending valuable strategies to develop academic writing competencies through social actions led by graduate students. The implementation of such initiatives, in conjunction with institutional support, is recommended to increase successful outcomes for graduate students to curb dropout rates in the context of higher education. Future research efforts should focus on social learning in virtual writing groups to ascertain if the benefits of exchanging, observing, and modelling can materialize digitally.

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Professional kinship using social media tools: Bridging and bonding to develop teacher expertise

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Abstract

The purpose of this collective case study research was to discover the impact school culture, internal factors, and the state of flow have upon motivating a teacher to develop teaching expertise. This research was designed to determine why and how individual teachers can nurture their existing internal factors to increase their motivation to seek expertise development and to explore how school culture, internal factors, and state of flow may encourage or limit the development of expertise. One major finding of this study concerned how experts choose their professional learning experiences and build professional learning networks based on their perceived weaknesses in content, pedagogy, or social-emotional attributes. They seek to improve their weaknesses to improve student learning through the key motivating factor of Teacher-Student Kinship representing an almost family-like relationship. Expert teachers bond with peers within their school, but also bridge with peers outside of their school. This bonding and bridging have become more accessible with the use of various social media technological tools from YouTube to professional learning networks on Twitter. The use of social media and other technology tools has allowed experts to develop Professional Kinship and enhance their practice regardless of location and proximity with peers within their professional learning community. These major findings hold implications for theory, practice, and future research particularly in the realm of teacher quality and the change of mindset towards the profession and the standards of education.

Introduction

In the beginning of the COVID-19 global pandemic, educators found themselves quickly transitioning from teaching in-person in their classrooms to teaching virtually from their homes in as little as twenty-four hours. This sudden shift left teachers feeling even more isolated than previously noted (Flinder, 1988; Ostovar-Mamegui & Sheikhahmadi, 2016). Additionally, many were unprepared for their new technological reality of virtual teaching. Teachers quickly began seeking tools and resources to navigate a virtual teaching world. Previous research concerning teachers who consistently seek expertise, demonstrates such professionals will leverage the skills and knowledge of peers within their schools to develop professionally. However, if the professional learning within their schools is found to be insufficient, teachers will seek a nurturing learning environment (Mayeaux & Olivier, 2016). The crisis of the pandemic highlighted the existing need to understand how and why teachers use social media to develop professionally and to form networks and relationships. The purpose of this collective case study research was to discover the impact school culture, internal factors, and the state of flow have upon motivating a teacher to pursue teaching expertise through their engagement in online teacher communities on social media platforms.

Social capital is defined as the networks and relationships built upon trust that allow professional learning to occur (Paxton, 1999, 2002; Putnam, 2000). For this study, bonding is defined as the peer networks and relationships within the school and bridging is defined as the networks and relationships outside of the school (Putnam, 2000). Prior to the last 25 years, such bridging required teachers to seek outside development through professional organizations, conferences, and/or higher education opportunities. Online communities have removed the barriers of distance and created opportunities for teachers to bridge a variety of professional learning, both formally and informally organized (Beach, 2017; Kelly & Antonio, 2016; Lantz-Anderson et al., 2018; Marcia & Garcia, 2016; Rehm & Notten, 2016; Trust et al., 2016). Research is needed to create a deeper understanding of how, what, and why teachers are using online communities for their own professional learning, both through bridging and bonding.

The study is an extension of a previous study of teachers who pursue expertise development (Mayeaux & Olivier, 2016). The previous study found teachers who pursue expertise development seek deep-impacting professional learning both inside and outside of the school. Experts choose their professional learning experiences and build professional learning communities based on their perceived weaknesses in content, pedagogy, or social-emotional attributes. Teachers who pursue expertise seek optimal professional relationships that exemplifies maximized social capital, which we will term *professional kinship*.

Interestingly, teachers pursuing expertise will choose their professional learning experiences and build professional learning networks based on their perceived weaknesses in content, pedagogy, or social-emotional attributes. They seek to improve these weaknesses to improve student learning driven by this Teacher-Student Kinship (Mayeaux & Olivier, 2016). Expert teachers bond with peers within their school, *if* peers meet the perceived professional needs (Mayeaux & Olivier, 2016). However, teachers who pursue expertise also bridge with peers outside their school while seeking knowledge or skills unavailable through and within their school (Mayeaux & Olivier, 2015). Teachers who pursue expertise value their students through reflective and effective teaching practices as defined in the research (Good & Brophy, 2008; Hattie, 2003, 2009; Hattie & Clarke, 2019; Marzano et al., 2003).

Teachers pursuing expertise are highly focused on the teaching process and work harder to achieve the next level of expertise due to their high self-efficacy (Mayeaux & Olivier, 2016). In their teaching, they often experience flow - the mental state of operation where a person is so fully immersed in an activity or experience a feeling of extreme energized focus, complete involvement, and success in the activity occurs - which motivates them in their relationships with students and with peers (Csikszentmihalyi, 1990; Mayeaux & Olivier, 2016). Such teachers also hold high internal factors, which include efficacy, craftsmanship, flexibility, interdependence, and consciousness (Costa & Garmston, 1998; Mayeaux & Olivier, 2016). These factors increase and decrease based on external situations and experiences but play highly into individual motivation and persistence. Teachers pursuing expertise have strong internal factors and experience flow in their teaching due to their teacher-student kinship and seek strong professional kinship to continually develop their craft (Mayeaux & Olivier, 2016).

This closely relates to our understanding of professional capital, which is the summation of human capital, decisional capital, and social capital (Hargreaves & Fullan, 2013). Over the past decades, research on the impact of professional learning communities has demonstrated bonding of teachers within a school is critical to the growth of the individual teacher (Hall & Hord, 2020; Putnam, 2000). However, teachers who bridge outside of their schools, to develop, share, and receive innovative ideas (Putnam, 2000; Bommel et al., 2020). When teachers bridge outside of their school, their social capital or professional networks expand to encompass a more diverse group of educators, which in turn creates opportunities for exponential growth (Bommel et al., 2020; Fukuyama, 2001; Hall & Hord, 2020; Hargreaves & Fullan, 2013; Putnam, 2000).

Such growth has primarily occurred through formally-developed professional learning communities, which have been the source of research for decades (Darling-Hammond & McLaughlin, 1995; Dufour, 2004; Guskey & Sparks, 1996; Hall & Hord, 2020; Hord & Rutherford, 1998; Huffman, 2000b; Huffman et al., 2001; Hughes & Kritsonis, 2007; Lantz-Andersson et al., 2018; Moller, 2006). The emergence of online learning communities has increased the option of informally-developed online learning communities. However, research of this new community structure is lacking. Lantz-Andersson et al. (2018) define informally-developed online learning communities as social-media based communities, where teachers share, filter, and curate new ideas. Additionally, the authors identify such

communities as a source of emotional and professional support for teachers (Lantz-Andersson et al., 2018).

Informally-developed online learning communities also possess critical attributes which appeal to teachers who pursue expertise. The professional learning is available in an asynchronous format, which allows people to engage at their leisure and at their own comfort level (Carpenter & Krutka, 2015; Trust et al., 2016). Such design may appeal to teachers pursuing expertise as they can engage in what content appeals to them, when the need arises. The reach of such communities spans the globe and offers ideas to teachers possibly not found within their school community. Finally, the level of engagement is individual and optional. One could simply be lurker, active listener, or the person leading the discussion.

For the past 20 years, social media has increasingly become a vehicle for professional learning for teachers (Beach, 2017; Kelly & Antonio, 2016; Lantz-Anderson et al., 2017; Marcia & Garcia, 2016; Rehm & Notten, 2016; Trust et al., 2016). The use of social media and other technology tools has allowed teachers to develop professional networks to enhance their practice regardless of location and proximity with peers in such a network. Understanding how and why teachers who pursue expertise may bridge with peers in informally-developed online learning communities is important in our understanding of how teachers form social capital through social media.

Methodology

The collective case study design was chosen to explore how teachers use social media to bond and bridge to create social capital. The qualitative collective case study focused on the social media presence of teachers followed by others for their teaching expertise. Lantz-Anderson et al. (2018) share informal teacher networks via social media have grown over the past twenty years.

Sample

Twenty teachers, who have a YouTube channel with consistent posts, were chosen based on four criteria related to the channel: (1) over one-million views, (2) at least ten-thousand subscribers, (3) managed by a classroom teacher, as opposed to an organization or school; and 4) focused primarily on classroom practice. The teachers ranged from teaching pre-school to high school subjects. All information is publicly accessible, and all teachers remain anonymous in this study.

Research questions

Three research questions were formed to drive the study. The questions were directly related to questions suggested in multiple studies in an effort to better understand teachers' professional learning activities in informally-developed online learning communities (Lantz-Andersson et al., 2018; Marcia & Garcia, 2016; Bommel et al., 2020).

Research Question 1: How do teachers use social media to share and receive content?

Research Question 2: What forms of knowledge are shared and received?

Research Question 3: How do teachers use social media platforms to increase their social capital?

Processes

The teachers' social media use was investigated to identify platforms teachers used primarily for professional learning purposes, knowledge they shared, and how others engaged with these teachers. First, the channels were analyzed for demographic data including teaching level and content of the teacher, number of subscribers, views, and other social media connections. Secondly, videos on each channel for the past five years were analyzed for topic and content. Finally, the top three videos of each channel were viewed for content, topic, and viewer engagement as evidenced by the comments. The data from these videos were coded and analyzed for themes. The content was then reanalyzed for purpose and audience. Finally, the comments of the viewers and the hosts' responses were analyzed for content, engagement, and themes. All individuals remained anonymous. All information in the third part of the study was public access and public knowledge.

Results

Demographics

The twenty teachers hosting YouTube channels ranged from elementary teachers to high school (or secondary) teachers. Experience was not explicitly stated on all channels, but five of the twenty teachers began their channels during their first year of teaching and each had less than six years of experience. Six teachers indicated they had over 15 years of experience. 18 teachers were from the United States. Two teachers indicated they taught in private schools with one sharing ideas for religious lessons. Seven teachers were male and 13 were female. Table 1 presents the number of teacher participants for each teaching level.

Table 1: Level of teachers (N = 20)

Teaching Level	Number of Teachers
Elementary	11
Middle School	2
High School	7

Engagement

The engagement on each channel demonstrated the reach of the informally-developed online learning community. Engagement was determined by the number of subscribers, views, and user engagement each channel produced. There

was a wide range in the engagement with one channel garnering a high of 736,000 subscribers, while the lowest one had 36,000 subscribers. The oldest channel was started in 2008 and the newest channel began in 2020. Channel views indicated a high of 48,402,317 views for the most viewed channel to 1,616,922 views for the lowest viewed channel. The most viewed channel was initiated in 2015 and the least viewed channel began in 2008. With average views of 9,059,560, these 20 channels are daily reaching a wide range of individuals around the globe, as evidenced by the comments posted. The individual channel engagement is not shared to maintain anonymity. Table 2 presents the channel engagement including averages and range for subscribers and views.

Table 2: Channel engagement

Engagements	Sum	Mean	Maximum	Minimum
Subscribers	7,291,550	364,000	736,000	36,000
Views	172,121,635	9,059,560	48,402,317	1,616,922

Research Questions

Three research questions were developed to guide the exploration of how teachers engage, share, and receive professional learning to develop social capital through social media.

Research Question 1

How do teachers use social media to share and receive content?

Each channel was primarily connected to one teacher who shared the information via videos. The videos ranged in length from 2 minutes to 76 minutes. The most popular videos were under 20 minutes.

The female teachers primarily shared information either within their classroom setting or a modified virtual classroom in their homes. The information was shared using a personal style with a focus on facial expressions and voice inflections. These personal style hosts spoke to the audience as if the viewers were present and there was a friendly conversation occurring. The hosts made comments like, "I know you have had this experience, too" or "We have all struggled with situations like this…" These videos were colourful and often found the host walking around and sharing specific elements in the classroom. These hosts also shared personal stories about their teaching and teaching experiences. In some videos the hosts were emotional about an event in their school or classroom, particularly when they were struggling to find a solution. The elementary teachers were also more likely to connect their content to online marketplaces, either their own on such places as Teachers-Pay-Teachers or a sponsors' website. The secondary teachers also shared connections to sponsors, but not as consistently as the elementary teachers. All the teachers were very open

about the monetization of their channels and openly shared when they were being sponsored by a company for using a service or product. The male teachers were primarily focused on tech tools and were straight-forward with step-by-step guides. These videos tended to have less of the teachers' faces and more recording of the screen demonstrating how to use the tech tool. Two male teachers used drawing software to create a storyboard to share their content and they were seldom seen on the videos.

Additionally, teachers connected their YouTube channels with other social media and marketplace sites. Instagram was the most popular site with eleven of the channels connecting to a partner Instagram page. These connections were used by the younger teachers. The older teachers primarily used Facebook and/or Twitter. Twelve of the channels linked to a website with blogs. These allowed the channel owners to connect resources and other elements for viewers to use. Additionally, through one video, partnerships between three of the teachers were discovered. One of the channel hosts made a comment about partnering with two other channel hosts. Further exploration found two of the teachers had created a joint podcast linked to both of their channels. Table 2 indicates the number of teachers using the identified platform.

Table 3: Platforms connected to YouTube channels

Platforms	Number of YouTube Channels
Amazon	2
Teacher-Pay-Teachers	5
Twitter	8
Instagram	11
Facebook	8
Pinterest	3
Podcast	2
Blog/Website	12

The comments on the top videos of the channels revealed several interesting elements. First, viewers on these channels were not only teachers. Many comments came from students who shared things like, "I wish you were my teacher." One of the most positive and common types of comments came from students expressing the videos had inspired them to become teachers. Others came from parents who shared comments such as, "I shared this channel with my child's teacher to help her with organization."

Overall, the comments were generated from teachers and were categorized into four major themes. The first theme represented simple *appreciation* for the teacher sharing the information. Most of the comments began with "Thank you so much for sharing this idea" or "I really appreciate this video." The overwhelming gratitude demonstrated teachers are truly seeking help with specific issues. This willingness to find solutions is evidence of teachers seeking to increase

their internal factors of efficacy, craftsmanship, flexibility, interdependence, and consciousness (Costa & Garmston, 1998).

The second theme represented *inquiry for additional knowledge* and was evident through the requests of more information from the host or from others viewing the video through a question or a simple request. Some hosts responded to such requests, but other teachers also responded with more information. Sometimes, the host would create another video to meet the need of repeated requests and then link it in the comment box.

The third theme, *personal sharing* of their own struggles and need for support through the interdependence of other. These comments included words illustrated the teachers' frustration and stress over figuring out how to navigate solutions to their problems. The frustrations were particularly high after the start of the pandemic and the move to virtual teaching platforms. The teachers sometimes shared frustration with their schools and districts by stating "I have to use this tool tomorrow for my class and I have never even heard of it until today. Thank you for helping me." The trend of expecting teachers to successfully utilize tools and strategies in which they had not yet been trained was evident through the tech tool videos. However, their willingness to learn and learn quickly again demonstrated their desire to develop their internal factors of efficacy, craftsmanship, flexibility, interdependence, and consciousness (Costa & Garmston, 1998).

The final theme, *professional and personal sharing*, represented teachers shared how they used the information, adapted the solutions, and the results achieved. These types of comments often received comments from other peers and occasionally the host.

Research Question 2

What forms of knowledge are shared and received?

The channels were primarily used to share tools and tips about teaching. The analysis of the videos revealed topics represented seven categories. Tech Tools videos accounted for the greatest number of videos at 33% of the views. These videos were straight-forward, how-to videos about tech tools teachers can use. The most popular tools were those connected to Google Classroom. The Tech Tools videos were created primarily by male teachers and were more straight-forward with less personal examples. Videos about what to do and how to teach virtually accounted for 19.8% of the videos. These videos focused on how to use the tech tools in an instructional manner. Teachers often modelled a lesson and showed how to use the tool to support students. In these videos, teachers were more personally engaging, often showing pictures of their lessons and sharing insights into how their students engaged in the lessons. They also were more reflective about their own teaching.

Organizing the Classroom videos accounted for 14.1% of the videos. These videos were about how to organize the classroom to support better student engagement and behaviours. The most popular videos were classroom set-up videos or first day of school videos where the teacher showed step-by-step how to set up a classroom. These videos were the highlight of the teachers teaching elementary education. The secondary teachers did not share as many videos of this type. Similar to the Teacher Life videos, the Organizing the Classroom videos were often sponsored by a company with sharing links of where to buy the products suggested in the videos. Often the products were produced by the teacher and connected to their teacher store on Teachers-Pay-Teachers or Etsy. Formal Professional Learning included videos about graduate school experiences and professional conferences.

Teacher Life videos focused on tips about life as a teacher and accounted for 10.8% of the content on the twenty channels. These videos included everything from what to wear for events, such as Meet the Families, to what type of lunch box is the best. These videos were often sponsored by the product company teachers recommended with links to where to buy the products.

One interesting element is there were graduate programs sponsoring the videos, as well as organizations sponsoring the videos. The monetization of the content was openly discussed. Content videos (17.2%) included videos other teachers could share with students to teach content or examples of how to teach a specific type of content. These were created primarily by secondary teachers and linked content resources for teachers to use. Primarily, these videos focused on the delivery of content, rather than on content-based strategies. Finally, Non-Teacher Related videos included videos about teachers' personal lives outside of teaching. These videos included information, such as buying a new home or life events, such as weddings. On one channel, these videos had become the second and third most popular. The comments included congratulations and well-wishes. The teachers also linked connections to any vendors mentioned in the videos. Table 4 presents the video topic categories and the number and percent of videos within each category.

Table 4: YouTube video topics by category (N = 6256)

Category	Number of Videos	Percentage
Non-Teacher Related	169	0.027
Teacher Life	678	0.108
Tech Tools	2069	0.330
Virtual Teaching	1241	0.198
Organizational Teaching	880	0.141
Formal Professional Learning	87	0.014
Content	1077	0.172

Research Question 3

How do teachers use social media platforms to increase their social capital?

The top videos and comments were analysed to understand how teachers use social media to increase their social capital. As previously stated, host teachers connected their YouTube channels to other social media and market-place outlets. Viewing teachers were able to comment on the videos, share "likes" and "dislikes" with the host. Additionally, the host and peers could react to the comments by responding or sharing information. There was a disproportionality to the engagements, which indicated more lurkers exist than those who truly engage with the content. For example, the most viewed video had 3,476,237 views with 63,154 likes and 1034 dislikes. There were only 1,034 comments for this video. These comments primarily were thanking the host for the information. The video-to-comment ratio is low across channels indicating most people watch the videos, but do not engage in discussion beyond appreciation and few suggestions. The direct building of Social Capital is not necessarily evident through the channels. Viewers are more lurkers, rather than engagers in a community dialogue. The videos do offer ideas for solutions for a variety of issues and teachers can quickly find resources to support the suggestions.

Additionally, one creator discussed the detrimental impact the creating her channel had had upon her school culture with leadership forbidding her to continue to use her classroom after hours to create videos and also monitoring her content. The issues had developed to the point where she had chosen to leave the school and move to another state. Currently, she is not teaching. As with state of flow, more information needs to be gathered through interviews and surveys to understand the impact such channels may have upon the school culture.

Conclusions

Teachers who pursue expertise are savvy in their use of social media. The hosts of the channels often shared how the practice of hosting a channel improved their own professional learning. Additionally, their passion evidenced their experience of flow in teaching. The hosts were often excited to share new ideas and suggestions with their audience. They also shared their professional and personal struggles. The use of social media allowed them to create networks with large groups across the globe and quickly find answers to issues they are experiencing. However, to further establish the evidence of flow, future research will include interviews with creators of the content.

The viewers however were much less engaged and connected. The study did not show teachers forming true professional relationships with smaller, intimate groups. There was some evidence of Professional Kinship type relationships between some of the hosts who had formed connections and then worked together to create podcasts and additional channels. However, the topics were primarily about organizing teaching or teacher life. Lacking in the

videos was consistent discussion about actual best practices pedagogy. One limitation to such videos would be the need for students to be present in the videos to model how such pedagogy occurs. The reflection of their teaching the teachers shared in their classroom blogs was particularly useful in modeling reflection, but without student work or seeing the lesson executed, the audience struggles to connect to the deeper contexts.

Another surprising element is the monetization of the content. The hosts were open about these social media elements being a source of second income for them. One shared how during the unemployment of a spouse, the income was invaluable. The amount earned is difficult to estimate without knowing the amount sponsors are spending and how much the hosts are earning on different platforms such as Teachers-Pay-Teachers.

Social media does allow teachers to develop their practice regardless of location and proximity with peers to their school. They are freely able to bridge across online communities to seek what information they need. Yet, this study demonstrated little evidence these teachers form true networks or relationships with each other. The asynchronous element is also a barrier to such relationships. Videos from five years ago are still receiving comments, but few people are engaging with each other. While such informally-developed online learning communities have been demonstrated to be sources of emotional and professional support for teachers as they asynchronously engage at their leisure and comfort-level, deeper exploration is needed to understand how this type of engagement impacts the development of expertise (Carpenter & Krutka, 2015; Lantz-Andersson et al., 2018; Trust et al., 2016).

These findings hold implications for theory, practice, and future research particularly in the realm of how teachers who pursue expertise use and engage in informally-developed online learning communities to bridge with peers and form social capital.

Acknowledgments

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Novel micro-learning-based mobile-assisted language app for Mandarin Chinese

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Abstract

Mobile-assisted language learning (MALL) was first introduced in 1993 and became a sub-area of the growing field of mobile learning research. It has inspired learners to make use of the "anytime" and "anywhere" technology, the key concepts in MALL. Though some mobile apps for Mandarin learning are available, many challenges of the current MALL technology have been recognized.

In order to tackle these challenges, we (author and her colleague in Computer Science Department) have designed a mobile app (Android and iOS) as a Mandarin supplementary learning tool, using micro-learning theory. Learning content can be easily customized as needed according to the textbook, which allows both seamless alignments with college curriculum and more quantitative study of MALL technology, with a large group of students over a long period. In addition, the data of students' behaviours and performances, including how often the student used it and what the results are, can be traced. The analysis of these data allows the use of micro-learning for both students and instructors, which facilitates the language learning. We will pilot the app and conduct various experiments in multiple sections of Chinese I in our college to assess the effectiveness of the proposed app for free. The app can be also applied to other foreign languages with little effort.

Introduction

While Mandarin is considered one of most difficult languages (according to the language difficulty rankings by US Foreign Service Institute), it is also one of the most popular foreign languages in the world. It is spoken by over 1 billion people worldwide. There are 873 million native speakers of Mandarin Chinese, and a further 178 million secondary speakers (Austin, 2020). One of the hardest is mastering the tones of Mandarin. Another thing that makes Mandarin unique is its writing system, there is no alphabet in Mandarin. Due to Mandarin being a tonal language, it is very easy to cause misunderstandings when you are a new learner. However, unlike other foreign languages, US schools lack enough qualified instructors and supplementary teaching materials (Wen, 2017).

What is Mobile-assisted language learning (MALL)?

Mobile technology has become an essential element of our daily life. It has changed our lifestyle, and more importantly, our learning style. Mobile-assisted language learning (MALL) was first introduced in 1993 and became a sub-area of the growing field of mobile learning research (Stockwell, 2014; Burston, 2014; McCarty, 2017). We have implemented this technology in our new teaching tool – a novel micro-learning-based mobile-assisted language app and apply these new learning trends in Mandarin Chinese acquisition. MALL has been considered an ideal solution to overcome language learning barriers in terms of time and place (Miangah, 2012). It has inspired learners to make use of this "anytime" and "anywhere" technology, which utilizes a micro-learning concept to deliver language learning materials to the students (Thornton & Houser, 2005).

What is micro-learning?

Microlearning is about getting maximum benefits through minimal input. It deals with small learning topics and short-term learning activities, and has been widely used in language acquisition. It delivers small quantities of information that leave a lasting impression (Wu & Li, 2015). Micro-learning can facilitate self-directed lifelong learning, as short activities can be easily integrated into everyday activities. Language learning needs daily learning, more practice, more improvement.

The micro-learning concept has been implemented in training and learning for a long time. But since recent decades, it has combined with technology to provide many web applications and mobile apps, and also has been adopted by the proposed Mandarin learning mobile app.

Literature review

Mobile-Assisted Language Learning (MALL) deals with the use of mobile technology in language learning. In contrast to classroom learning, in MALL there is no need for the learners to sit in a classroom or at a computer to get learning materials. In fact, MALL can be considered an ideal solution to language learning barriers in terms of time and place Mobile-Assisted Language Learning (MALL) deals with the use of mobile technology in language learning. In contrast to classroom learning, in MALL there is no need for the learners to sit in a classroom or at a computer to get learning materials. In fact, MALL can be considered an ideal solution to language learning barriers in terms of time and place.

The theoretical foundation of MALL

As early as 1885, the famous Ebbinghaus forgetting curve theory was born. The theory states that humans start losing the memory of learned knowledge over time, in a matter of days or weeks, unless the learned knowledge is consciously reviewed time and again (Ebbinghaus, 1913). Statistics also show that humans forget approximately 50% of new information they encounter within an hour and an average of 70% within 24 hours. After a week, the average goes up to 90% (Kohn, 2015). How do you solve this problem? George Miller's Information Process Theory proposed a solution. It says a learner's attention span and short-term memory is limited to processing information in chunks (Miller, 1956). Chunking content into small, manageable sections makes learning more manageable and easier to integrate into long-term memory (Moran, 2016). This is the theoretical source of the micro-learning concept. Traditionally, micro-learning has been used primarily in a blended learning process, combining face-to-face instruction with micro-learning for follow-up and reinforcement (Elmlearning, 2021).

With the advancement and development of technology, especially the emergence of mobile technology, micro-learning has become the theoretical basis for the perfect combination of learning and this technology. Especially for language learning, the use of Micro-learning to design apps has become a trend (Redondo, 2021).

Advantages of the MALL

Micro aspects refer to vocabularies, phrases, sentences and grammar rules, which are essentially the focus of curriculum of second language learning in American colleges (Power & Shrestha, 2009). Studies have commonly emphasized the mobility of MALL devices, which lets the users take advantage of these devices wherever and whenever they want to learn small language concepts. Learning is not restricted to four-wall classrooms in this type of learning. This unique feature of mobile devices results in many other advantages in language learning (Cherian & Williams, 2008, Chinnery, 2006, Kennedy & Levy, 2008, Kukulska-Hulme, 2009, Wishart, 2008). MALL can be formal or informal, and mobile devices may form a bridge connecting in-class and out-of-class learning. When learning takes place outside the classroom, it is often beyond the reach and control of the teacher. But it is also an opportunity to revitalize and rethink current approaches to teaching and learning (Kukulska-Hulme, 2012).

Limitations of the current MALL

A few well-recognized commercial language mobile apps, such as Rosetta Stone, Duolingo, Busuu, also adopted the concept of MALL and they prove to be effective to learn language (Rosetta Stone, Duolingo final report, Busuufinal report). These studies only target some languages and they do not target college students and the users are a very motivated group (only 45% of participants have completed the study and 70% of them have BA or higher degrees). These apps often require learners to learn topics in a certain order other than customization and it limits opportunity for real-world practice (Gobler, 2021). In addition, these apps are not easily adopted with college curriculum, because (a) the apps are designed for self-study and not for use within the context of a course and the curriculum in the apps cannot be modified, hence they cannot meet the needs of school students to review what they have learned in the class; (b) these language apps do not allow instructors to edit language content and customize exercises.

Some publishers, e.g. Pearson Inc and Cheng & Tsui Inc, provide both a Chinese textbook and an online workbook. These workbook exercises prove to be very helpful since they align with the textbook contents very well. It allows students review what they have learned in the class. However, they only provide a web-based interface and often require students to complete exercises on PCs, instead of mobile devices. Burston (2014) found that most materials in MALL are teacher-led and scheduled, not leveraging the anytime, anyplace mobile environment (Goodwin-Jones, 2011; Kukulska-Hulme & Shield, 2008). In other words, students in one class will complete the same exercises with the same schedule and requirements out of classroom. Language learning could be enhanced in new, innovative ways and can be improved with the assistance of mobile devices. Viberg and Gronlund (2014) suggested more study on user's time management using mobile apps which could potentially improve the effectiveness of the use the app. Hence, further research and understanding of technology may lead to better and more efficacy designs.

Research Problems

To tackle the above issues, we designed and developed a mobile app for learning Mandarin (iChineseExercise or ICE app on Android and iOS). It includes two features: instruction-customized materials, which tackle the challenges that current MALL face. We are conducting preliminary experiments in some Chinese I class using the mobile app and received positive feedback from student participants for its ease of use and instant feedback.

Compared to the regular MALL apps, the proposed ICE app has the following unique features: (a) it allows instructors to customize learning materials, hence it can seamlessly align with curricula. The ICE app will automatically customize the exercise/review content and schedule for students, (b) it provides the attempts and time consumed in every questions, and these data are useful for students to review concepts, as well as instructors to analyze and understand students' learning performances on each concept (Figures

1a-b).

The ICE app includes two modules, the instructor web portal (Figures 1c-d) and the student mobile app (Figures 1a-b). In the mobile app, all the exercises will be available for students to preview, review and post-review. Currently, there are three simple games-based exercises available (Figure 1a). The instructor's web portal includes three different users: system administrator, instructor, and book administrator. The ICE app allows instructors to customize language materials, which includes vocabulary, sentences and grammar (Figures 1 a & d). These materials are organized by textbook, hence they can be seamlessly aligned with the curriculum. These materials will be automatically transferred to each exercise activity on the mobile apps.

We would like to use the App to be a new teaching tool to answer our research questions. Based on the above-mentioned literature review and our proposed Mandarin mobile app, the study aims to answer the following research questions:

1. Does a mobile app customizing for a textbook improve Chinese I students' overall vocabulary proficiency?

2. Does a mobile app customizing for a textbook improve Chinese I students' overall syntactic accuracy in sentence production?

Figure 1: The interfaces of the mobile app and instructor web portal. (a) The main interface of the above, including three games; (b) grading book, including both grades, time-used and attempts; (c) main menu of the teacher's portal on web; and (d) web interface allows teachers to add new vocabulary and sentences for exercises.

Methodology

We piloted the ICE App for two semesters and conducted both experiments and surveys. Given the ethical concerns to have one group of students potentially advantaged by

the use or non-use of a technology, we give two different groups access to the ICE app at different times during the course (before and after midterm). Both groups of students have had access to the same technology. The timing in which this access occurs is necessarily going to have some kind of effect. Both groups will take midterm and final exams, which cover materials without overlap.

Experimental design

In order to answer the proposed research questions, we conducted separate experiments in the Spring and Fall terms of 2019, with and without the use of the app. Knowing a word involves more than knowing a word's definition (Johnson & Pearson, 1984). In fact, learning the vocabulary of a discipline should be thought of as learning about the interconnectedness of ideas and concepts indexed by words. The dimensions theory (Cronbach, 1942) is used to create vocabulary quizzes and exam questions to check the effect of the app:

- Generalization: The ability to define a word

- Application: Selecting an appropriate use of the word

- Breadth: Knowledge of multiple meanings of the word

- Precision: The ability to apply a term correctly to all situations

- Availability: The ability to use the word productively

The vocabulary quiz has been given after every lesson finished. Vocabulary knowledge is multifaceted. Students should be familiar with the meaning, know words related to the term (phrase and sentence), and have flexibility with using it in both written and oral form. The dates of the five quizzes were: February 27, March 18, April 3 and 22, and May 6, 2019 (15 students used ICE, 15 students did not use it). The tables provide assessment examples in the quiz (Table 1) and mid-term exam (Table 2).

Table 1: Sample quiz (please write down the corresponding Chinese character.)

1	2	3	4	5	6	7	8	9	10
You	I/me	fine/well	to be	She/her	teacher	student	also/too	he/him	not/no

Participants

There are two groups' students participated in the research. They are all freshmen in level 1 Chinese class in a US college. To make a fair comparison, the authors selected students from two classes from the same level in two semesters (see Table 3).

Table 2: Design and examples of the mid-term questions

Dimensions	Generalization	Application	Breadth	Precision	Availability
Assessment goal	Vocabulary	Sentence production	Vocabulary	Sentence production	Sentence production
Assessment methods	Vocabulary quiz	Select an appropriate assigned word for the sentence	Select an appropriate assigned word/phrase for the sentence.	Write a sentence using the assigned words	Write a paragraph/dialogue using the assigned words
Sample questions	Write Chinese character according to the English meaning: English: student Chinese: ____	Fill in the blank using the following words: 我喜欢__ _中文课。 A 学; B 上 C 读; D 写	Select correct pinyin for the underline word. 人行道在银行的前面。 A. xíng B. háng	Rearrange the following words according to the English sentence. My friend is a New Yorker. 朋友/我的/人/是/纽约	Write a short dialogue using the following words. 宿舍/室友/进来/介绍/有/几个

Table 3. Participants in the experiment (before midterm)

	Males using App	Females using App	Males w/o App	Females w/o App	Language level
Spring 2019	5	10	6	9	I
Fall 2019	4	5	4	5	I

Procedure

In Spring 2019 (15 weeks), we chose a Chinese I class which was taught in a US college, including 30 students, to conduct our experiment. The class was split into two groups, each group had 15 students (see Table 3). One group was given access to the ICE app before the midterm exam. They used the ICE app to practice out of classroom and complete their homework; while another group was assigned regular homework and exercises. After the midterm, the two groups were switched. The exam scores of students using the ICE app before the exam were the results from the experimental group, the exam score of students without using the ICE app before the exam were the results of the control group. The midterm exam covered lessons 1-3 and the final exam covered lessons 4-6. The instructor gave feedback to students every week. So, students can know which questions they answered wrongly and what they need to do to improve. Teachers would announce the learning outcomes of the whole class to students, so that students can have a comprehensive understanding of their own learning situation of the whole class.

In Fall 2019 (15 weeks), we did another experiment. The experiment was conducted in a Level I class with 18 students. The experimental setup is the same as in Spring 2019. One group was given access to the ICE app at the beginning of the semester and they used the ICE app to practice out of classroom and complete their homework; while another group practiced out of classroom and completed their homework at the same time using the traditional method. After the midterm, the two groups switched. The midterm exam covers lessons 1-3 and the final exam lessons 4-6. The students received the feedback and statistical data too.

One survey was conducted before the semester ended. Students of the above two groups completed the pre- and post- experiment survey in May and December in the Spring and Fall semesters of 2019.

Results

We have used two methods to do analyses: experiments and surveys. We present the results of the differences between the experimental and control groups in Spring and in Fall 2019 as well as the results from the two surveys conducted at the end of both semesters.

Experiment

We collected all scores of the five quizzes and a midterm and used a box-and-whisker chart to compare the quiz scores of the two groups.
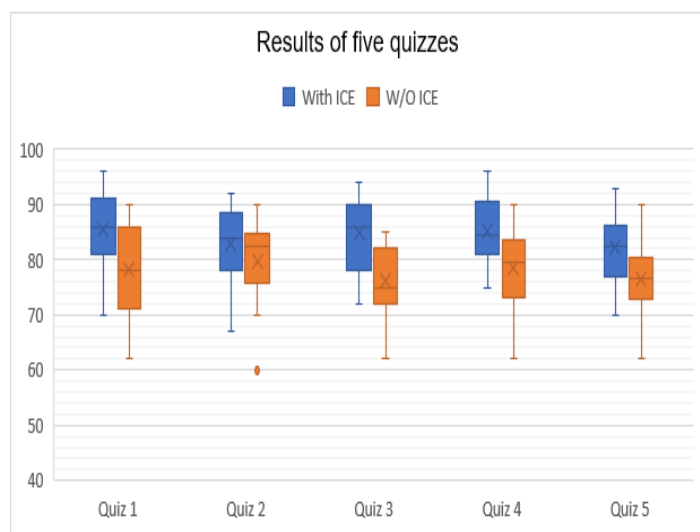

Figure 2: Results of five quizzes.

The results of the five quizzes from two groups show: the medians of the group using the ICE app and the group without using the ICE app are 82-85 and 76-78, respectively. The difference of medians between the two groups are 7.2, 3.1,7.6, 5.6, 5.7, respectively. The difference in values of quiz 2 is only 3.1, the reason is some words of Lesson 2 (Name) is based on Lesson 1 (Greeting). Unlike an alphabetic system, Chinese is a character-based writing system. One of the features of Chinese characters is radicals which are the base components of each character. Chinese radicals can hold information about the character's meaning and/

or sound. They often reflect some common semantic or phonetic characteristics. There are around 200 radicals in Chinese. Knowing common radicals can greatly help you learn new Chinese characters. For example: 您 (lesson 2) and 你 (lesson 1). "您" has the same meaning as "你"，but is more polite and can show your respect for the person you are addressing. So "你" and radical "心" (means heart) form a new character "您". Another example: 她 (lesson 2) and 他 (lesson 1). "她" means she/her, "他" means he/him. The only difference of these two characters is the radicals. "她" has a radical of "女" (means female) , "他" has a radical of "人" (means male/human). Many Chinese characters are related, and the meaning or sound of the character can be found from the radicals and the same components.

Another feature of Chinese characters is the composition of phrases. For example: "英文" (means: English language) and "法文" (means: French language) in lesson 2 and "中文" (Chinese language) in lesson 1. They all consist of two parts: country name and language name. Maybe you do not know the exact meaning of this phrase, but if you know the meaning of "文", it will be easier to infer that this phrase must mean a language.

The result of the Chinese I midterm exam in Fall 2019 (a total 18 students (9 students used the ICE app, and 9 students did not use it) participated in the test on October 28, 2019) is shown in Figure 3.
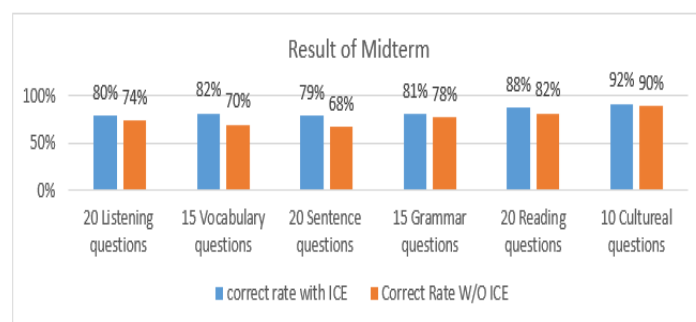
Figure 3: Result of midterm (Fall 2019).

In the initial stage of Chinese learning, words and sentence patterns are the most important parts. When designing the midterm, we focus on the assessment of words and sentence patterns. As can be seen from the following table (Table 4), we assess students' mastery of words and sentence patterns from four aspects: listening, speaking, reading, and writing.

Survey

After using the app in two semesters, we did a survey in each semester, both in Spring and Fall 2019. In total, 48 students participated. Figure 4 shows the results in five different aspects. From the survey, we tried to understand whether students liked the design and which part is their favorite activity. The most liked feature is the exercise feedback. It shows the data which includes how many attempts and how long it takes for each question, and the statistics of the whole class. The second favorite feature is the instructor's feedback. This is also the main reason why we designed this

Table 4: Assessment contents of each part of the midterm

Focus	# of questions	Assessment contents		
Listening	20	10 questions are on Pinyin.	10 questions are on vocabulary and sentences.	
Vocabulary	15	10 questions are on definitions.	5 questions are on writing and radical assessment.	
Sentence	20	10 questions are on grammar.	10 questions are on forming sentences.	
Grammar	15	5 questions are on part of speech.	5 questions are on measure words.	5 questions are on tense.
Reading	20	This part is a comprehensive assessment, include vocabulary, grammar and sentence.		
Culture	10	This part is about the knowledge of Chinese culture.		

App, which allows students to request help from instructors after class. The other favorite feature includes the content of the app. 72.9% of students agree that the app helps to improve their grades. 39.6% of students said that they like the games in the app.

Figure 4: Survey of all students from two semesters.

From the results of these assessments, we can find:

a   While grammar and pronunciation are important in foreign languages, learning vocabulary provides the content of listening, speaking, reading and writing. Expanding your foreign language vocabulary is one of the crucial elements to master a new language. The major resource to design the ICE app is the vocabulary in the textbook. The games of the app are mainly based on vocabulary; hence students have more chances to practice them. We believe it's the reason that the difference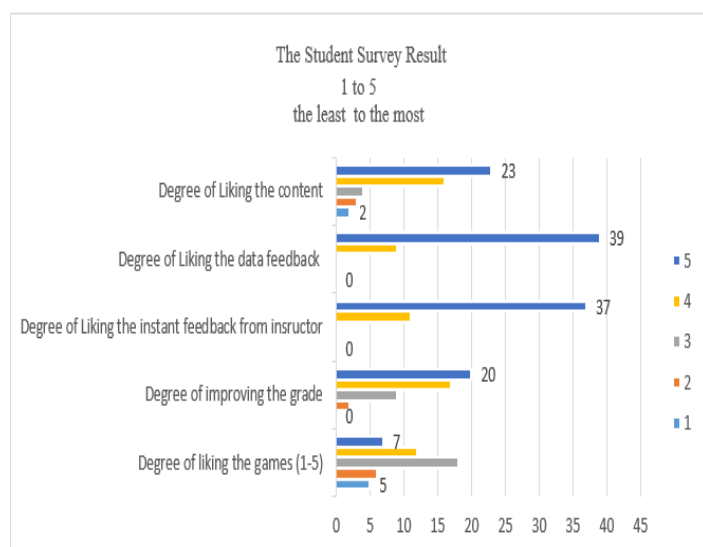 of learning performance in the vocabulary quizzes (Figures 2 & 3), The more students practice, the more students master the vocabulary.

b   It is not easy to form sentences while learning a new language. This is a common challenge students face in their second language acquisition. We use the sentence structures which are taught in the class and let students practice using the ICE app since this app incorporates many exercises of sentence-forming. If the students have mastered the sentence structure (Grammar) and have practiced enough, the students' mastery of sentence formation will improve naturally (Figures 3 & 4).

c   The students like to get instant feedback from the instructors after class and adjust the difficulty of the exercise which is the unique feature of the App. For compulsory courses in universities, students focus on learning performance instead of the fun of the app (Figure 5). So this is an effective supplementary learning tool for the students.

d   The design of this app is based on a textbook, so it is very helpful for students to master the classroom learning content, and the testing results shows that students using the ICE app improve their grades (Figures 3 and 4). Today's technology offers numerous options for educators and students to improve their teaching and learning performances. To get started, think about one new approach that could be the catalyst for positive change in your classroom.

In looking at our learning environment, what could benefit our students the most? Collaboration and interaction during the classroom and out of the classroom are the most important. This app meets both of these requirements.

Conclusions

Improving students' learning performance is the goal. In this paper, we focus on a study of learning performance using the proposed app. The experiment shows the app is an effective tool for both vocabulary and sentence formation. In fact, many data in this app can help teachers improve their teaching performance. For example, if the number of students' attempts of some questions were far more than others, the instructors should be aware whether the questions are explained clearly or if they need more clarification. In the

future, we plan to disseminate the software (the app and data analysis) to more instructors for free, collect more data and conduct data analytics to improve both students' and instructors' teaching and learning performance.

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Knowledge and uptake of e-learning among Nigerian students during the COVID-19 lockdown

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Abstract

This study evaluates the uptake of e-learning among students of Ado-Odo Ota local government area, Nigeria, during COVID-19 lockdown. The study was a descriptive cross-sectional survey of primary and secondary school students from January to February 2021. Data were analysed with IBM-SPSS version 25.0. 28.4% knew about e-learning; 14.7% have ever participated in e-learning, and 8.4% participated during the lockdown. Only 26.6% had access to the internet, computers (1.1%), and phones/tablets (5.5%). The primary reason for not participating in e-learning was lack of awareness (78.2%), no money to buy data (8.9%), and no computers/android/tablets (12.9%). Overall, 57.1% attended tutorials outside their homes, but almost 43.4% said three people shared a bench. Education does not have to be shut down due to pandemics, and students should not be limited to only classroom teaching methods but be introduced to e-learning.

Introduction

The COVID-19 lockdown has wreaked havoc on every facet of human life, including education. The virus's rapid spread took a toll on the educational system, forcing many schools to close (Handebo et al., 2021; Rahmon, 2020; United Nations Development Programme, 2020). According to a United Nations Educational, Scientific and Cultural Organization (UNESCO) assessment, the temporary shutdown of educational facilities has negatively impacted 1.6 billion students in 191 countries (UNESCO, 2020). In Nigeria, the Federal Ministry of Education ordered the instant shutting down of secondary and primary schools across the nation on the 19th of March due to the outbreak of the disease in the country (*The Guardian*, 2020). All public and private schools were required to close their doors under government instruction. Although the school closures were to contain viral spread within the premises, limit transmission to other vulnerable individuals, and maintain public health, they have had significant consequences on students' learning (Baldwin & Mauro, 2020; Lindzon, 2020). Additionally, the far-reaching effects of social distancing and the associated lockdown measures, as well as school closures, have harmed the educational sector and may affect the educational system in the long run (Nicola et al., 2020; Yinka & Adebayo, 2020a).

Literature review

Electronic learning (e-learning) is an organised course or learning experience given electronically; it may also include performance support content (Eze et al., 2018). Additionally, an e-learning program can consist of live or pre-recorded lecture content, video, quizzes, simulations, games, activities, and other interactive elements. While education can take place in or out of the classroom, the primary component of E-learning is the use of computers and the Internet. E-learning is sometimes referred to as network-enabled skill and knowledge transfer, in which education is delivered to a large number of recipients simultaneously or at different times (Abdulhamid et al., 2017). Initially, it was not universally accepted because it was considered that this system lacked the human factor necessary for learning. However, e-learning has offered several advantages like remote access to various classes, independent learning, reduced cost and access to videos and audio materials that can be rewound anytime (Sunil, 2017). Also, as technology advances and learning systems improve, it is becoming more welcomed by even developing countries. With the COVID-19 pandemic, e-learning expanded into low- and middle-income nations, albeit several obstacles have constrained it. Like in Nigeria, resistance to e-learning system adoption before the pandemic was attributed to a lack of awareness, poor management support, insufficient funding, inadequate infrastructures, abysmal management commitment to an interactive knowledge environment, inadequate training and workforce, and inadequate internet facilities (Aboderin, 2015; Okundaye et al., 2019). However, these issues have not been totally addressed, but the pandemic has increased the chances of implementing an effective e-learning system in Nigeria.

E-learning became imperative in developing and sustaining educational advancement, considering the adverse effects of the COVID-19 lockdown on the traditional education system. However, the closing of schools has once again exposed the chasm between advanced economies' educational institutions and those in developing countries such as Nigeria (Dawadi et al., 2020). Again, the pandemic has exposed significant discrepancies among Nigerian schools. While some private schools in urban areas have embraced online education to engage their pupils, many less privileged children have been left out (Eze, 2021; Mseleku, 2020). Unlike advanced countries, most schools in developing countries lack the necessary infrastructure to participate in online education (Ayebi-Arthur, 2017; Dawadi et al., 2020; UNDESA, 2014). Since e-learning relies on technology infrastructures, such as the internet, computers, tablets, and smartphones, disparities in their availability exacerbate educational access and quality differences.

Before the outbreak, most nations, including Australia, Italy, Germany, and Hong Kong, implemented timely online learning responses (Crawford et al., 2020). Nonetheless, experts have demonstrated that the pandemic has placed enormous strain on education in these countries (Crawford et al., 2020). As a result, it is projected that the pandemic would have a more significant negative impact on schools that did not have online learning platforms before the outbreak (Kachra & Brown, 2020; Zhong, 2020). The pandemic's indirect effects include disrupted schooling and a lack of access to education, particularly in low- and middle-income nations (Zar et al., 2020). COVID-19's impact on education is particularly severe in low- and middle-income countries, where education systems have historically operated on inferior platforms (Dan-Nwafor et al., 2020; Yinka & Adebayo 2020b). Additionally, it is difficult to provide a safe learning environment for pupils in these regions' overcrowded, resource-constrained institutions (Zar et al., 2020). The epidemic has a distinctive dispersing effect on education in Africa and other nations, resulting in a fall in educational attainment, a widening of existing disparities in access to and outcomes from teaching, and an increase in school dropouts (Blundell et al., 2020).

In Nigeria, the danger to education is exacerbated by a unique set of vulnerabilities, including inadequate health systems, poverty and inequality, hunger, internally displaced populations, high population densities, a gap between urban and rural areas, and an out-of-school population (Obiakor & Andeniaran, 2020). Before COVID-19, Nigeria accounted for one out of five out-of-school children worldwide. In Nigeria, over 10.5 million children aged 5-14 years were out of school, and only roughly 61% of children aged 6 to 11 years received regular primary school education (UNICEF, 2013). COVID-19 consequences compound the underlying educational difficulties that have put Nigeria and some other developing countries behind in preparing young people for the dynamic workplace (Dan-Nwafor et al., 2020). For example, while the COVID-19 pandemic is transforming digital and online education globally, primary and secondary school students in rural and underserved regions continue to fall behind due to a lack of skills and resources necessary to adapt to or transfer to new learning channels.

Additionally, the shortage of reliable internet infrastructure and electrical supplies has deterred students who may possess the skills required to engage in internet-based learning (Crawford et al., 2020; Zhong, 2020). Thus, remote learning (including radio, television schooling, and online learning apps for primary and secondary learners and virtual libraries and online classes at universities) becomes imperative for all students during the lockdown. Institutions with insufficient resources and socially disadvantaged students who lack access to technology and the internet, as well as students' unwillingness to participate in an online environment, undercut the government's response (Zhong, 2020). The pandemic has had a significant impact on education in three ways: most pupils have missed out on valuable educational opportunities, lost access to critical school-provided services, and created room for more students to lag behind (Obiakor & Andeniaran, 2020). As a result, these effects are expected to exacerbate gaps in educational quality and socioeconomic equality due to school closures. Only a smaller proportion of learners in urban areas, who are more likely to come from higher-income families, have a greater chance of accessing education during school closures via technology (Obiakor & Andeniaran, 2020).

In contrast, most learners from poor homes and underserved rural and suburban areas are left behind (Zhong, 2020). Apart from that, students in schools lacking the means or capacity to adapt to e-learning are now missing out on education (Leung and Sharma 2020). Learning at home may also be difficult, leaving a more significant proportion of the learner population behind. These issues are a source of concern for all stakeholders in education (Crawford et al., 2020). Thus, even though most states in the country are currently responding via radio and television, a sizable proportion of learners continues to face difficulties in their education. Our study assessed the knowledge and uptake of e-learning among some Nigerian students to give the necessary recommendations to all stakeholders in the education sector.

Methodology

Study area

This study was carried out in Ado Odo Ota, one of the 19 local government areas of Ogun State. It was established on the 19th of May, 1989, after the merger of Ota, part of the defunct Ifo / Ota Local Government (LG), with Ado-Odo/ Igbesa Areas of the Yewa South Local Government Areas (LGAs). It shares a border with metropolitan Lagos State. Ado-Odo Ota LGA has a population of 526,565 at the 2006 census and a population projection of 733,400 in 2016 as estimated by City-Population (2019). The target population is composed of students from primary three to senior secondary school three (SSS3), aged eight (8) to twenty (20) years, who reside within Ado-Odo Ota Local Government Area.

Research design

The study was a descriptive cross-sectional survey conducted using a questionnaire as the study instrument to obtain responses from secondary school and below students. The study was carried out between the 25th of January and the 13th of February, 2021, to determine the knowledge and the use of e-learning among students of Ado-Odo Ota LGA during the six-month lockdowns (March to September 2020). The students were identified using a stratified random sampling technique. This approach involved grouping public and private schools into wards. There are sixteen political wards in the LGA. Schools were randomly selected through a random walk and quotas (Hoffmeyer-Zlotnik et al., 2003). This technique involves investigators beginning the interview process at a random school in a geographic location within the sixteen wards of the LGA and then following a determined route to target the schools to be surveyed, selecting the nth schools, determining along the tracked route.

Inclusion and exclusion criteria

All students (males and females) from primary three to senior secondary school three (SSS3) of at least eight (8) years and not older than twenty (20) years, were included. The study participants were students in Ado-Odo Ota LGA. All students below primary three and those unwilling to participate in the study were excluded. Students in primary three and above were between eight (8) and twenty (20) years old, and were assumed to be more informed and capable of answering questions about the COVID-19 pandemic and e-learning, hence younger students in lower classes were excluded from the study.

Sample size calculation

The sample size was calculated using the formula below based on a margin of error of 5% and a confidence level of 95%; the sample size was estimated at 380 primary and secondary school students.

The sample size was calculated using the formula below:

$$n = \frac{Z^2 \alpha/_2 \, p(1-q)}{d^2}$$

Where n=sample size

Z= standard normal deviation with 95% confidential interval = 1.96; d = absolute precision = 0.05.

The final minimum sample size n was 383.

38 schools comprising 19 public and 19 private schools were randomly selected from the 16 wards, with a maximum of ten students interviewed from each school.

Data analysis

Data processing was effectuated using the IBM-Statistical Package for Social Sciences (IBM-SPSS) version 25.0 for Windows IBM Corp., Armonk, N.Y., USA. The descriptive data include the socio-demographic characteristics of the respondents, knowledge and perception of COVID-19, knowledge, and uptake of e-learning. Data were described as percentages/proportion, mean/average, and standard deviation and were presented as charts or tables. Chi-Square analysis was conducted to determine the association between variables setting a significant level at $p<0.05$.

Ethical considerations

The ethical research clearance was sought and obtained from Nigeria's National Health Research Ethics Committee with NHREC Approval Number NHREC/01/01/2007-20/01/2021. Approval was also obtained from the LGA authority. Only participants that consented to participate were interviewed, and the information obtained from the respondents was made confidential and was only used for research purposes.

Results

Socio-demographic characteristics of student respondents
There were 380 students, out of which 227 (59.7%) were males, and 153 (40.3%) females. More than half (57.6%) of the students were aged 11-15. About three-fifths (61.6%) were Christians, and 38.4% were Muslims. Half of the students (50%) were from public and 50% from private schools. Primary school students constituted 28.9%, junior secondary (38.4%), and 32.6% senior secondary school students.

The majority of the students' fathers (43.2%) and mothers (40.3%) were graduates, 18.9% fathers and 13.9% mother attained post-graduates, while only a few (2.4%) fathers, and 5.8% mothers reached either primary school or were not educated (Table 1).

Table 3 shows that about three-fifths (60.5%) of the students in both private and public schools had home lessons during the lockdown (p > 0.05). More than half (56.5%) of the public students were taught by home teachers as compared to 37.4% of private school students. The proportion of private school students that attended tutorials outside their homes was 60.5% compared to 53.7% of public-school students (p>0.05).

A higher proportion of private school students (80.5%) said they read books every day at home during the lockdown, compared to public-school students (71.6%), p<0.05. However, 22.6% of public-school students did not learn any skills during the lockdown compared to 17.4% of private-school students.

About the preventive measures taken against the spread of COVID-19 in the tutorials, most students from both the private (97.9%) and public (98.4%) schools said they had face masks (p>0.05). However, only 65.3% of private-school students said they used face masks regularly compared to 77.4% of public-school students (p<0.05). Similarly, slightly more than half (51.3%) of private school students said they sat very close to other students compared to 59.8% of public-school students (p>0.05). More than half of private school students (50.8%) said three students were sitting on a bench during tutorials compared to 36.5% of public-school students. On the other hand, 54.0% of public-school students said two people shared a seat compared to 30.5% of private-school students. Overall, only 13.9% of all the students said they sat on the bench alone during the tutorials (p<0.05).

Table 1: Student respondents' socio-demographic profiles

Variable	Response	Frequency	Percentage
Gender	Male	227	59.7
	Female	153	40.3
Age category	≤ 10	64	16.8
	11 – 15	219	57.6
	16 – 20	97	25.5
Religion	Christianity	234	61.6
	Islam	146	38.4
Type of school	Private	190	50.0
	Public	190	50.0
School Grade	Primary	110	28.9
	Junior secondary	146	38.4
	Senior secondary	124	32.6
Father's education	Post-graduate	72	18.9
	Graduate	164	43.2
	Diploma/NCE	47	12.4
	Secondary	88	23.2
	Primary/no formal	9	2.4
Mother's education	Post-graduate	53	13.9
	Graduate	153	40.3
	Diploma/NCE	54	14.2
	Secondary	98	25.8
	Primary/no formal	22	5.8

Impact of COVID-19 lockdown on educational activities of public and private school students in Ado-Odo, Ota

Table 2: Knowledge of and access to online learning during COVID-19 lockdown among private and public-school students

Knowledge of virtual/online learning	All cases n (%)	Private (%)	Public n (%)	P-value
Have heard about virtual/online learning	108 (28.4)	65 (34.2)	43 (22.6)	0.012*
Ever participated in e-learning	56 (14.7)	37 (19.5)	19 (10.0)	0.009*
Participated in any e-learning during COVID-19 lockdown	32 (8.4)	19 (10.0)	13 (6.8)	0.268
Have regular access to the Internet for online learning	101 (26.6)	61 (32.1)	40 (21.1)	0.015*
Used personal/parents' computer for e-learning	4 (1.1)	2 (1.1)	2 (1.1)	0.481
Used personal/parents' phone or tablet for e-learning	21 (5.5)	12 (6.3)	9 (4.7)	0.501
Training through television	7 (1.8)	4 (2.1)	3 (1.6)	0.703
Household has electricity generator	380 (78.4)	153 (80.5)	145 (76.3)	0.318
Reason for not using e-learning				
Not aware of it	272 (78.2)	125 (73.1)	147 (83.1)	
No money to buy data	31 (8.9)	19 (11.1)	12 (6.8)	0.080
No computer or android/tablet	45 (12.9)	27 (15.8)	18 (10.2)	

* Significant at p<0.05.

Table 3: Offline learning activities among private and public schools during the COVID-19 lockdown

Activities during the lockdown	All cases n (%)	Private n (%)	Public n (%)	P-value
Did home lesson during lockdown	230 (60.5)	117 (61.6)	113 (59.4)	0.805
Teacher at home during lockdown				
Parents	53 (23.0)	333 (28.7)	20 (17.4)	
Siblings	60 (26.1)	35 (30.4)	25 (21.7)	0.024*
Home teacher	108 (47.0)	43 (37.4)	65 (56.5)	
Others	9 (3.9)	4 (3.5)	5 (4.3)	
Did tutorial outside home during lockdown	217 (57.1)	115 (60.5)	102 (53.7)	0.178
Time spent learning daily during lockdown				
1 – 2 hours	190 (68.3)	96 (50.5)	94 (49.5)	
3 – 5 hours	82 (29.5)	44 (31.0)	38 (27.9)	0.857
>5 hours	6 (2.2)	3 (2.1)	3 (2.2)	
Read books every day at home	289 (76.1)	153 (80.5)	136 (71.6)	0.041*
Learnt any skills during lockdown	76 (20.0)	33 (17.4)	43 (22.6)	0.200
Preventive measures taken in tutorials				
Have face mask	373 (98.2)	186 (97.9)	187 (98.4)	0.703
Wear face mask regularly in the tutorial				
Yes	271 (71.3)	124 (65.3)	147 (77.4)	0.009*
No	109 (28.7)	66 (34.7)	43 (22.6)	
Sat close to another student(s) in tutorials	120 (51.3)	59 (51.3)	61 (59.8)	0.209

The average number sitting per bench				
One	17 (13.9)	11 (18.6)	6 (9.5)	
Two	52 (42.6)	18 (30.5)	34 (54.0)	0.027*
Three	53 (43.4)	30 (50.8)	23 (36.5)	

* Significant at p<0.05

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Table 4 displays the knowledge of e-learning was generally poor among the students (28.4%) but significantly increased with the level of education with 17.3% among primary pupils, 28.1%, and 38.7% among junior and senior secondary school students have heard about it (p<0.001). Only 14.7% have ever participated in any e-learning activity, with just 9.1% of primary, 11.6% junior, and 23.4% of senior secondary school students (p<0.05). During the COVID-19 lockdown, only 8.4% of the students have participated in any form of e-learning.

Only about one-fourth (26.6%) of all the students had access to the internet, with the highest proportion (35.5%) among senior secondary. Also, just 1.1% had access to parents' or personal computers for learning, 2.4% senior secondary, 0.1% junior secondary, and none among primary school pupils (p>0.05). Similarly, just 21 (5.5%) had access to personal/parents' phones or tablets for e-learning; 7.3% among senior secondary, 5.5% junior secondary, and 3.6% primary pupils (p>0.05). Through the television, those who participated in e-learning constituted just 1.8% of all the students with 7.3%, 5.5%, and 3.5% senior secondary, junior secondary, and primary school pupils, respectively (p>0.05). The majority of the students (70%) only had access to electricity once in a while. However, the majority of the students' households had electricity generators (78.4%) (p>0.05). For those who did not participate in any e-learning process, the primary reason was the lack of awareness (78.2%), 8.9% said there was no money to buy data, and 12.9% said that they did not have access to computers or android phones/tablets (Table 4).

Table 4: Knowledge of and access to e-learning among primary and secondary school students during COVID-19 lockdown

Knowledge of online learning	All cases n (%)	Primary n (%)	Junior secondary n (%)	Senior secondary n (%)	P-value
Have heard about virtual/online learning	108 (28.4)	19 (17.3)	41 (28.1)	48 (38.7)	0.001*
Ever participated in e-learning	56 (14.7)	10 (9.1)	17 (11.6)	29 (23.4)	0.004*
Participated in any e-learning during COVID-19 lockdown	32 (8.4)	4 (3.6)	8 (5.5)	20 (16.1)	0.001*
Have regular access to the Internet for online learning	101 (26.6)	21 (19.1)	36 (24.7)	44 (35.5)	0.014*
Used personal/parents' computer for e-learning	4 (1.1)	0 (0.0)	1 (0.1)	3 (2.4)	0.533
Used personal/parents' phone or tablet for e-learning	21 (5.5)	4 (3.6)	8 (5.5)	9 (7.3)	0.547

Training through television	7 (1.8)	0 (0.0)	2 (1.4)	5 (4.0)	0.362
Access to electricity					
Everyday	86 (22.6)	22 (20.0)	41 (28.1)	23 (18.5)	
Three days interval	28 (7.4)	7 (6.4)	10 (6.8)	11 (8.9)	0.333
Once a while	266 (70.0)	81 (73.6)	95 (65.1)	90 (72.6)	
Household has electricity generator	380 (78.4)	84 (76.4)	116 (79.5)	98 (79.0)	0.821
Reason for not using e-learning					
Not aware of it	272 (78.2)	91 (85.8)	105 (76.1)	76 (73.1)	
No money to buy data	31 (8.9)	9 (8.5)	12 (8.7)	10 (9.6)	0.102
No computer or android/tablet	45 (12.9)	6 (5.7)	21 (15.2)	18 (17.3	

* Significant at $p<0.05$.

Table 5 shows that overall, 60.5% of the students did home lessons during the lockdown, with a percentage of 70% of primary, 63.7% junior secondary, and 48.4% of senior secondary school students ($p<0.05$). Almost half (47.0%) were trained at home-by-home teachers. 24 (31.2%) primary school pupils were taught at home by their parents, 17.2% junior and 21.7% senior secondary school students. Students thought at home-by-home teachers accounted for 40.3% of primary school, 57.0% junior secondary, and 40.0% of senior secondary school students ($p<0.05$).

More than half (57.1%) of the students attended tutorials outside their homes during the lockdown, with 49.1% of primary, 63.0% of junior, and 57.3% of senior secondary school students ($p>0.05$).

The majority (69.3%) of the students spent one to two hours a day learning during the lockdown. Also, 76.1% said they read their books at home during the lockdown, 85.5% among primary, 79.5% junior secondary, and 63.7% of senior secondary school students ($p<0.001$). However, very few of the students, 76 (20.0%), had the opportunity to learn any skills during the lockdown ($p<0.05$).

All junior secondary school students (100.0%) and 99.1% of primary school students said they had a face mask compared to 95.2% of senior secondary school students ($p<0.05$). However, 75.0% of senior secondary, 74.0% of junior secondary and 63.6% of primary school students said they used face masks regularly ($p>0.05$). More than three of five primary school pupils (61.1%), 59.8% of junior secondary, and less than half (45.1%) of senior secondary school students said they shared a bench with other students during the tutorials ($p>0.05$). Almost half of the primary (45.5%) and junior secondary (49.2%) students said three people shared a bench during the tutorials compared to 33.3% of senior secondary students. Similarly, 42.4% of primary and 46.4% of junior secondary school students said two people shared a bench compared to 36.4% of senior secondary school students. Only 4 (12.1%) of primary and 3 (5.4%) junior secondary school students said they did not share a bench with any other student in the tutorials during the lockdown compared to 30.3% of senior secondary school students ($p<0.05$), Table 6.

The major skills the students learned during the lockdown include tailoring/sewing (39.5%), hairdressing (9.2%), computer skills (7.9%), carpentry (7.9%), musical instruments (6.6%), and costume making (6.6%). Others include welding (3.9%), shoemaking/repairing (3.9%), generator engineering (3.9%), baking (3.0%), and barbing (2,6%), as shown in Figure 1.

Table 5: Offline learning activities of primary and secondary school students during the COVID-19 lockdown

| Knowledge of COVID-19	All cases n (%)	Primary n (%)	Junior secondary n (%)	Senior secondary n (%)	P-value
Did home lesson during lockdown	230 (60.5)	77 (70.0)	93 (63.7)	60 (48.4)	0.002*
Teacher at home during lockdown					
Parents	53 (23.0)	24 (31.2)	16 (17.2)	13 (21.7)	
Siblings	60 (26.1)	22 (28.6)	20 (21.5)	18 (30.0)	0.026*
Home teacher	108 (47.0)	31 (40.3)	53 (57.0)	24 (40.0)	
Others	9 (3.9)	0 (0.0)	4 (4.3)	5 (8.3)	
Did tutorial outside home during lockdown	217 (57.1)	54 (49.1)	92 (63.0)	71 (57.3)	0.083
Time spent learning during lockdown					
1 – 2 hours	190 (68.3)	54 (68.4)	69 (69.7)	67 (67.0)	
3 – 5 hours	82 (29.5)	25 (31.6)	27 (27.3)	30 (30.0)	0.603
>5 hours	6 (2.2)	0 (0.0)	3 (3.0)	3 (3.0)	
Read books every day at home	289 (76.1)	94 (85.5)	116 (79.5)	79 (63.7)	<0.001*
Learnt any skills during lockdown	76 (20.0)	12 (10.9)	28 (19.2)	36 (29.0)	0.002*
Preventive measures that were taken in tutorials classes					
Have face mask	373 (98.2)	109 (99.1)	146 (100.0)	118 (95.2)	0.009*
Wear face masks regularly in the tutorial					
Yes	271 (71.3)	70 (63.6)	108 (74.0)	93 (75.0)	0.106
No	109 (28.7)	40 (36.4)	38 (26.0)	31 (25.0)	
Sat close to another student(s) in tutorials	120 (55.3)	33 (61.1)	55 (59.8)	32 (45.1)	0.106
The average number sitting per bench					
One	17 (13.9)	4 (12.1)	3 (5.4)	10 (30.3)	
Two	52 (42.6)	14 (42.4)	28 (46.4)	12 (36.4)	0.027*
Three	53 (43.4)	15 (45.5)	27 (49.2)	11 (33.3)	

* Significant at $p<0.05$.
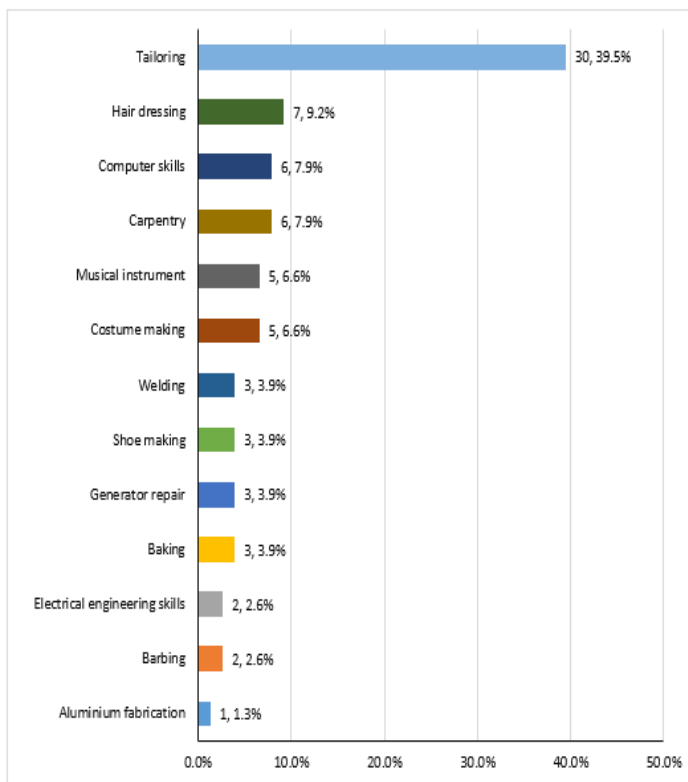
Figure 1: Skills learned during COVID-19 lockdown

Discussion

Due to restrictions, educational institutions as essential parts of society were affected by COVID-19 lockdowns as school premises were paralysed. Thus, other alternative learning methods had to be explored. Although students from developed countries have been learning online, this system is still new in many African countries, including Nigeria. Only a few private and public higher institutions currently engage in online learning, particularly during the outbreak of the COVID-19 pandemic and the lockdowns that followed. In comparison, education activities were ongoing non-stop among elementary students in developed countries during the lockdown due to e-learning, that was available to students from their respective homes. Most Nigerian schools are yet to implement this learning method. As a result, it is small surprise that there was little awareness of online learning and insufficient access to it.

The study examined the knowledge and access to online learning between public and private schools, and both recorded insignificant percentages. However, the study reported challenges affecting the e-learning of all students.

A significant challenge this study highlighted as a problem limiting e-learning is electricity. The power supply is one of the most significant setbacks to e-learning in Nigeria. Devices that are needed for this process require electricity, which has always been a problem for countries like Nigeria. Emeka et al. (2021) reported inadequate power supply as a challenge to e-learning, experienced in several regions of Nigeria. The study showed how students who live in urban areas do not have access to constant electricity, which is worse in rural areas because some cannot access electricity (Emeka et al., 2021). However, some may result in generator

use, but this will also come at an extra cost, which may be hard on sponsors because the cumulative cost during the e-learning process may be too expensive to bear. Studies in Guinea, South Africa, and Uganda have also documented how poor electricity has affected the educational process before COVID-19; students are subjected to harsh conditions, using candles and kerosene lamps while studying (Furukawa, 2012; Goodwin, 2013; Mills, 2012). This predicament is not the case in developed countries, as most students have been introduced to e-learning. With the advancement in technology and the constant electricity supply, this learning method will be made available to student is Nigeria as well.

The significant level of e-learning unawareness among respondents in this study, may also be due to the location that this study was conducted, which is a semi-urban area with several sub-standard schools. Also, before the emergence of the COVID-19, many schools had not been introduced to e-learning; some schools and students had not even been technologically capable, which may explain the lack of this learning method awareness among respondents. Human Rights Watch (2020) reported unawareness on e-learning among students in several African countries, showing how most African countries are utterly oblivious of this learning method. Human Rights Watch reported that students receiving no lectures, being asked to continue re-reading their notes, and parents in Congo idly wait for schools to reopen to continue their education and learning process (Human Rights Watch, 2020). The above show that the schooling system in most developing countries, like Nigeria, is already rigid in the face-to-face tradition of teaching and is unaware of other learning methods.

Another problem this study recorded was that respondents had no money for data and no computer or phone/tablets for e-learning. This result may be due to cost, particularly for low-income earners and families whose jobs were affected by the lockdown. Some schools demanded full payment for online lectures, coupled with the cost of data and devices; this might be difficult for students' parents and guardians, which may discourage e-learning among this group of people (Human Rights Watch, 2020). Findings point us as a nation towards adequate preparation against similar occurrences like COVID-19 in the nearest future. Even another lockdown is imminent if sufficient measures are not put in place to curb the spread of the ravaging delta variant of COVID-19 in Nigeria.

Since a significant number of respondents were not aware and did not participate in e-learning programs, this study reported offline learning among respondents; even though this was a violation of the lockdown protocol, this learning method was higher than e-learning. This result may be due to parents' being concerned about students lagging academically and being idle, so they took offline tutorial classes as the best option for learning or keeping their children busy. A report in Congo showed how parents were tired of seeing their children idle at home, waiting for school to resume, as students are likely to fall off academically, which may explain the significant rate of offline learning among respondents (Human Rights Watch, 2020). However, this study reported a substantial rate of offline learning in private and public-school students, with a considerable

number employing the services of a home teacher. This finding shows that most students and parents are already so familiar with the old tradition of teaching that they find it hard to adapt to e-learning. A study in Nepal also supported this claim, stating the limitations of e-learning and how students are finding it difficult to adjust, slowing the learning process of some students, because factors like environment, social contact, and interaction plays a significant role in learning (Dawadi et al., 2020). This report may explain the high use of home teachers among respondents to experience the same face-to-face tradition of teaching. Siblings also taught younger students; this may be due to parents' unavailability or illiteracy, as the level of family educational attainment may also determine these learning modes. A higher percentage of respondents were reported to spend one to two hours in offline learning during the lockdown, with the use of face masks both in private and public schools. Also, a significant number of respondents in private and public schools read books every day and some learnt a skill during the lockdown with significant number learning tailoring.

Conclusions and recommendations

This study found that the students did not observe COVID-19 preventive guidelines during the tutorials. Many students had face masks, but the rate of regular use was relatively low, implying a negative attitude towards the preventive measures. Students sat close to each other, further violating the social distancing protocol, with an average number of two to three students sharing a bench. However, this may be due to the challenges students encounter with online learning or lack of supervision or strict enforcement of lockdown rules in the LGA. Mseleku (2020) reported how most students find it hard to adapt to online learning. Also, the additional expenses and the limitations increase the rate of offline learning among students regardless of the lockdown protocol.

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Academic burnout, resilience level, and campus connectedness among undergraduate students during the Covid-19 pandemic: Evidence from Singapore

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Abstract

This study sets out to examine the level of academic burnout, resilience, and campus connectedness among undergraduates in Singapore. The data were collected from a total of 125 full-time undergraduates (75.6% response rate, 38% females, 62% males) from a public university in Singapore. The instruments used to measure academic burnout, resilience level, and campus connectedness are the Maslach Burnout Inventory-Student Survey (MBI-SS), the Academic Resilience Scale (ARS-30), and the Campus Connectedness Scale (CCS), respectively. The findings show that respondents on the whole had a moderate level of academic burnout, a high level of academic resilience, and campus connectedness. Female students reported a higher level of burnout, a marginally lower resilience level, and a higher level of campus connectedness than their male counterparts though there was no significant difference between the two groups. In addition, the findings indicate that there was no significant difference between the number of years enrolled in the university and the level of academic burnout, resilience level, and campus connectedness level. Further, the findings of this study show that academic burnout was negatively associated with resilience level and campus connectedness, and the resilience level was positively associated with campus connectedness. These findings provide direction for the university to redesign the assessment structure to support a blended learning environment and provide additional support to students facing academic burnout and undue stress from the pandemic.

Introduction

The Covid-19 pandemic took the world by storm and was an unprecedented challenge to the education system globally as it has impacted more than 1.7 billion students from 188 countries (Daniel, 2020; OECD, 2020). The 'new normality' (Tesar, 2020) began with many universities replacing face-to-face teachings with virtual remote learning (Basilaia & Kvavadze, 2020; Kuleva, 2020; Mulenga & Marban, 2020; Naciri et al., 2020; Sintema, 2020; Tzivinikou et al., 2020).

Educational researchers worldwide have been presenting studies examining the impact of the pandemic on students' academic performance, mental health, social connectedness, or life issues in China (Cao et al., 2020; Li et al., 2020; Tang et al., 2020; Wang & Zhao, 2020), France (Essadek & Rabeyron, 2020), Germany (Händel et al., 2020), India (Kapasia et al., 2020; Mahapatra & Sharma, 2020), Pakistan (Adnan & Anwar, 2020), the Philippines (Baloran, 2020), Saudi Arabia (Khan, 2020), Spain (Odriozola-González, 2020), Switzerland (Elmer et al., 2020), Ukraine (Nenko et al., 2020), the U.K. (Burns et al., 2020; Savage et al., 2020), the U.S. (Calhoun et al., 2020; Duong et al., 2020), and Vietnam (Tran et al., 2020). It appears that there is no study examining the wellbeing of undergraduate students in Singapore during the pandemic.

Academic burnout

Burnout is a psychological construct, and it was first introduced by Herbert Freudenberger (1974). He defined it as "to fail, to wear out, or become exhausted by excessive demands on energy, strength or resources" (p. 159). The term academic burnout was proposed by Nuemann et al. (1990) and was characterised by numerous traits such as exhaustion caused by excessive academic workload and expectations (academic fatigue), an increasing pessimism and lack of interest in school work (academic apathy), and having a weak personal development in educational affairs (academic inefficiency). Typical symptoms of academic burnout include disengaged in-class activities, not paying attention and feeling detached in class, high anxiety level over assessments, absenteeism, low morale, cynicism, and pessimism over academic success (Bikar et al., 2018; Demir et al., 2017; Naami 2009; Salami et al., 2017). It has a significant impact on students' performance (Garman et al., 2002; Villanova & Roman, 2002), mental health (Ahola et al., 2006; Eslami, 2011), motivation (Lee et al., 2020).

One of the most frequently employed measures of academic burnout is the Maslach Burnout Inventory-Student Survey (MBI-SS), a modified version of the MBI developed by Maslach & Jackson (1981). Prior studies employed the MBI-SS or its variant to examine academic burnout among undergraduate students in various countries such as China (Hu & Schaufeli, 2009; Zhang et al., 2005), Korea (Lee et al., 2020), Nigeria (Salami et al., 2017), South Africa (Friedman, 2014), Taiwan (Yang, 2004), or Turkey (Adoum, 2017; Tansel, 2015; Demir et al., 2017; Yavuz & Dogan, 2014; Yilmaz, 2009). For instance, Salami et al. (2017) employed the MBI-SS and Classroom Assessment Environment Scale (CAES) to examine the extent of the relationship between accountancy undergraduates' academic burnout and their perceptions of the classroom assessment environment in Nigeria. They reported that the level of academic burnout is positively associated with the increased perceived performance-based classroom assessment but negatively associated with the increased learning-based classroom assessment. More recently, Lee et al. (2020) employed an extended version of the MBI-SS where they included two additional dimensions: antipathy and anxiety, to examine the associations between specific burnout traits and motivation styles among Korean high school students. They found that distressed and well-functioning students were characterised by amotivation, internal motivation, and regulation. In addition, they reported that the struggling and laissez-faire students were classified as introjected and external regulation. However, both studies did not examine the association between academic burnout and gender, which has been widely reported in prior studies (e.g., Bikar et al., 2018; Demir et al., 2017; Gündüz et al., 2012; Kutsal & Bilge, 2012). For instance, using a sample of 406 students at Gazi University in Turkey, Bikar et al. (2018) examined the relationship between academic burnout and gender. They found male students reported a high level of academic burnout compared to their female counterparts. Their findings were also echoed by earlier studies conducted by Michaeli et al. (2014), Zahedbablaan et al. (2014), and Tansel (2015). On the contrary, Gündüz et al. (2012) and Yilmaz (2009) reported that female students were experiencing a high level of academic burnout than male students. Other studies reported there was no significant difference between the male and female students concerning academic burnout (Adoum, 2017; Azimi & Piri, 2013; Demir, 2017; Kutsal & Bilge, 2012; Marzoughi et al., 2013). Thus, it is inconclusive whether there is a significant difference in academic burnout between gender which calls for further examination.

Since the outbreak of the Covid-19 pandemic in December 2019, several studies were conducted to examine students' anxiety and academic burnout (Fernández-Castillo, 2021; Labrague & Ballad, 2020; Moreno-Fernandez et al., 2020; Sundarasen et al., 2020). Thus, it would be interesting to examine how the undergraduate students in Singapore cope during the pandemic and whether there is any significant difference in academic burnout between male and female students in Singapore.

Academic resilience

There has been growing research on university students' wellbeing and ability to cope with their studies during the pandemic (Aristovnik et al., 2020; Bono et al., 2020; Browning et al., 2021; Burns et al., 2020; Cao et al., 2020; Copeland et al., 2021; Kecojevic et al., 2020; Labrague et al., 2021; Waters et al., 2021; Yang et al., 2021; Zhang et al., 2020). Martin (2013) defined academic resilience as "a capacity to overcome acute and/or chronic adversity that is seen as a major threat to a student's educational development" (p. 488). It has gained momentum and recognition in schools as a framework to evaluate students' ability to bounce back from adversity to flourish within the university environment (Hartley, 2012; McGillivray & Pidgeon, 2015; Pidgeon et al., 2014; Seligman et al., 2009; Stallman, 2010). With an increasing level of academic stress and psychological distress, positive

psychology scholars argued that promoting resilience is crucial in reducing mental ill-health, improving academic performance, coping better with burnout and adversity, and enriching university experience (Bartley et al., 2010; Fallon, 2010; Gray, 2015; Hartley, 2011, 2012; Kilbert et al., 2014; Khawaja & Stallman, 2011; Lerner, 2006; McLafferty et al., 2012; Steinhardt & Dolbier, 2008).

Steinhardt and Dolbeir (2008) argued that academic, interpersonal, and environmental changes faced by students during their transition from high schools to universities had increased their stress and coping ability, resulting in a rising number of psychological disorders and emotional instability cases. Their views are also echoed by Hartley (2011), who pointed out that university life is often characterised by stressors such as high-stake summative assessments, relatively little academic support as students are expected to be more independent in their learning and taking on more personal and academic responsibility, facing isolation and even loneliness during the transition. Thus, promoting resilience among undergraduates is of paramount importance to align their educational goals with positive personal development and life satisfaction (Campbell-Sills et al., 2006; Li & Yang, 2006; Maddi, 2008).

Prior studies employed various instruments such as the Wagnild and Young's (1993) Resilience Scale (RS-14) (Fernandes et al., 2018; Gómez-Molinero et al., 2018; Jones, 2020; McGillivray & Pidgeon, 2015; Pidgeon et al., 2014), Connor and Davidson's (2003) Conner Davidson Resilience Scale (Buren, 2019; Debb et al., 2018), Smith et al.'s (2008) Brief Resilience Scale (Parker, 2018) to measure resilience level among college and university students. For instance, McGillivray and Pidgeon (2015) employed the RS-14 to examine the resilience level among Australian students aged between 18 to 57 years. They reported that students possessing a higher level of resilience displayed a lower level of psychological distress and a higher level of mindfulness. Pidgeon et al. (2014) also employed the RS-14 to examine the resilience level among 214 university students based in Australia, the U.S., and Hong Kong. They found that students with a higher level of resilience reported a higher level of social support and campus connectedness but a lower level of psychological distress. More recently, Buren (2019) employed the Connor Davidson Resilience Scale to study 70 students enrolled in a leadership program to examine their resilience level. She found that the relationship between the number of leadership program activities and each of the five resilience factors (persistency and tenacity; emotional and cognitive control; adaptability and bounce back; control; spiritual influence) was not significant. She also found no significant difference in resilience scores among gender, age, and student status (freshman and sophomore, junior, senior).

Hoge et al. (2007) noted that while each of the existing instruments purports to measure resilience, there is an inherent difficulty in defining the notion of resilience. Thus, there is little consensus on which of these instruments best applied and quantifies the resilience construct. While many universities were instructed by the government to offer online learning, students were facing the challenges of learning from home, students' anxiety, stress, and mental emotions were exacerbated during the pandemic (Zhang et al., 2020). Examining their resilience level may assist the development of suitable positive education programs in supporting their wellbeing and improving their coping ability.

Campus connectedness

Prior studies reported that having a sense of belonging to the university, educators, and other students is crucial in improving academic engagement and achieving better assessment performance (Astin, 1999; El-Ghoroury et al., 2012; Finn, 1989; O'Keefe, 2013; Robbins et al., 1993; Schlemper, 2011). This sense of belonging is referred to as campus connectedness, where scholars examined the extent of students' involvement and social connectedness in the university environment (Lee & Davis, 2000; Lee et al., 2002; Summers et al., 2002).

Prior studies examined various factors that may influence campus connectedness, which includes gender (Anderman & Anderman, 1999; Belenky et al., 1986; Furrer & Skinner, 2003; Olson & Shultz, 1994; Summers et al., 2002), ethnicity (Clark et al., 2012; Curtin et al., 2012; Johnson et al., 2007; Stebleton et al., 2010), life satisfaction (Karhbet, 2015; Karhbet et al., 2015; Matheny et al., 2008), number of years in school (Karhbet et al., 2015; Summers et al. 2002). For instance, Summers et al. (2002) sampled 3,900 undergraduate students from the University of Texas at Austin to examine the relationship between campus connectedness and diversity, using the Campus Connected Scale (CCS) developed by Lee and Robbins (1998). They reported that female students experienced a significantly higher level of campus connectedness and more openness to diversity than their male counterparts. Their findings are consistent with those reported by Belenky et al. (1986) and Furrer and Skinner (2003).

The above studies were conducted before the pandemic, and research on campus connectedness during the pandemic among undergraduate students is scarce. Thus, this study would examine predictors of campus connectedness, including gender and resilience. It will be interesting to investigate how students feel during the pandemic when they attended more online classes than physical classes, limiting their interaction with their peers, faculty, and campus facility.

Current study

The purpose of the study is to examine the level of academic burnout, resilience, and campus connectedness among undergraduates from a public university in Singapore. The hypotheses for this study are as follows:

H1a:	There is no significant difference in the level of academic burnout between female and male students.

H1b:	There is no significant difference in the level of resilience between female and male students.

H1c:	There is no significant difference in the level of

campus connectedness between female and male students.

H2a: There is no significant difference in the level of academic burnout between number of years enrolled in the university.

H2b: There is no significant difference in the level of resilience between number of years enrolled in the university.

H2c: There is no significant difference in the level of campus connectedness between number of years enrolled in the university.

H3:   There is a significant negative correlation between academic burnout, resilience level, and campus connectedness among undergraduate students.

Thus, it is believed that this is the first study examining the level of academic burnout, resilience, and campus connectedness among undergraduate students in Singapore during the pandemic. The findings from this study will provide opportunities for universities to implement effective interventions to support students' learning and coping with their university life during the pandemic. In addition, the findings will benefit educators to promote resilience and manage students' expectations for them to adapt and bounce back swiftly from adversity.

Method

Participants

The sample undergraduates were recruited from a public university in Singapore. The study employed a self-administered questionnaire, which includes demographic variables such as gender, course, and year of study. An invitation letter to the participants for this study was emailed to 176 full-time undergraduates who were the students of the researcher during the pandemic (March 2020 to June 2021). A total of 133 students responded and agreed to participate, which constituted a response rate of 75.6%. The final sample size comprised 125 full-time undergraduates (47 females, 78 males). These undergraduates are currently in their first (14.4%), second (18.4%), third (40.8%), and fourth year (26.4%) of their studies in the business (84%), engineering (8.8%), science (4.8%), humanities, arts and social sciences (2.4%).

Instruments

To measure the participants' academic burnout, the Maslach Burnout Inventory-Student Survey (MBI-SS), which comprises a 15-item scale with a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree), was used to measure each item. To examine students' resilience level, the Academic Resilience Scale (ARS-30) developed by Simon Cassidy (2015, 2016) was used, based on students' specific adaptive cognitive-affective and behavioural responses to academic adversity. As the ARS-30 is a relatively new resilience scale developed in the context-specific construct evaluating students' academic resilience based on their

responses to academic diversity, it is believed that the scale will be relevant in the pandemic where students experienced a different level of psychological reactions. Essentially, the ARS-30 comprises 30 items along a 5-point Likert scale from strongly disagree to strongly agree. In line with other instruments employed in this study, a 7-point Likert scale will be used in the ARS-30.

In line with prior studies conducted by Summers et al. (2002) and Pidgeon et al. (2014), the Campus Connectedness Scale (CCS) was employed to examine the level of campus connectedness. However, a 7-point Likert scale was used instead of the original version of the 6-point Likert scale. This is to minimise confusion and frustration for participants where all the three instruments employed in this study are based on a 7-point Likert scale. Negatively worded items in the three instruments are reverse-scored so that high scores indicate lower level of burnout, higher level of academic resilience, and higher campus connectedness across all items in the MBI-SS, ARS-30, and CCS, respectively.

Results

The overall mean score on the three instruments suggested that students on the whole had a moderate level of academic burnout (M = 3.86, SD = 0.82), high level of academic resilience (M = 4.70, SD = 0.61), and a high sense of campus connectedness (M = 4.36, SD = 1.20). The estimates of internal consistency measured by the Cronbach's alpha were fairly high (MBI-SS = 0.85, ARS-30 = 0.85; CCS = 0.93).

In terms of academic burnout, female students reported a higher level of burnout than their male counterparts though there was no significant difference between the two groups (female: M = 3.75, SD = 0.79; male: M = 3.92, SD = 0.82; t = 1.127, p = 0.506). With respect to resilience level, female students reported a marginally lower level than male students though there was no significant difference between the two groups (female: M = 4.62, SD = 0.64; male: M = 4.75, SD = 0.59; t = 1.154, p = 0.840). For campus connectedness, female students reported a higher level than the male students, though there was no significance difference between the two groups (female: M = 4.42, SD = 1.04; male: M = 4.32, SD = 1.29; t = -0.504, p = 0.051).

Table 1 displays the means and standard deviation between students' academic progression and their academic burnout, resilience level, and campus connectedness level. The mean scores for academic burnout ranged from 3.72 to 4.15, while the resilience level and campus connectedness among each group of students were relatively close, ranging from 4.60 to 4.83 and 4.22 to 4.59, respectively. The fourth-year students' academic burnout level is the lowest, suggesting they face relatively more pressure from their studies than their junior counterparts. The second-year students recorded the highest resilience level and campus connectedness. It may be noted that as students progressing to their academic journey, their resilience level and campus connectedness level were declining.

Table 1. Summary of means and standard deviations for academic burnout, resilience level, and campus connectedness level among students with different academic progression (N = 125).

	N	Academic Burnout		Resilience Level		Campus Connectedness	
		Mean	SD	Mean	SD	Mean	SD
First Year	18	4.15	0.70	4.67	0.51	4.22	1.17
Second Year	23	3.74	0.65	**4.83**	0.61	**4.59**	1.13
Third Year	51	3.89	0.84	4.73	0.67	4.38	1.22
Fourth Year	33	**3.72**	0.92	4.60	0.58	4.24	1.24
Overall	125	3.86	0.81	4.70	0.61	4.36	1.20

A series of one-way analysis of variance (ANOVAs) was conducted to examine any significant differences between the number of years enrolled in the university and academic burnout, resilience level, and campus connectedness. In line with the hypothesis, there was no significant difference found between these samples, on academic burnout $F(3, 125) = 1.32$, $p = 0.272$, resilience level $F(3, 125) = 0.69$, $p = 0.561$, or campus connectedness $F(3, 125) = 0.49$, $p = 0.691$.

Pearson's correlations were performed on academic burnout, resilience level, and campus connectedness, as summarised in Table 2. In line with the hypothesis, the results indicated that academic burnout has a negative association with resilience level ($r = -0.63$, $p < 0.001$), and also a negative association with campus connectedness ($r = -0.37$, $p < 0.001$), suggesting as scores on academic burnout decrease, the scores on resilience and campus connectedness also increased. In addition, resilience level also depicted a positive association with campus connectedness ($r = 0.45$, $p < 0.001$), inferring that, as scores on resilience increase, scores on campus connectedness increased.

Table 2. Summary of intercorrelations, means, and standard deviations for academic burnout, resilience level, and campus connectedness (N = 125).

Variable	1	2	3	Mean	SD
1. Academic burnout	-			3.86	0.82
2. Resilience level	-0.63**	-		4.70	0.61
3. Campus connectedness	-0.37**	0.45**	-	4.36	1.20

** p < 0.001

Discussion

This study examined academic burnout, resilience, and campus connected level during the Covid-19 pandemic among undergraduate students in Singapore. The findings suggested that students had a moderate level of academic burnout, a high level of academic resilience and campus connectedness.

The findings reported that female undergraduates experienced a higher level of burnout than male undergraduates though there was no significant difference between the two groups. These findings are consistent with those reported in the prior studies (Adoum, 2017; Azimi & Piri, 2013; Demir, 2017; Kutsal & Bilge, 2012; Marzoughi et al., 2013). Sundarasen et al. (2020) argued that female students faced a higher level of stress and anxiety during uncertain times such as the pandemic. Thus, they may express a higher level of academic burnout and having fewer coping strategies. However, two-thirds of the sample size comprises third and fourth-year students, and regardless of gender, they may have concerns over finding a full-time job upon graduation as the pandemic is far from over.

Concerning academic resilience, the findings reported that female students have a marginally lower level than male students though there was no significant difference between the two groups. A closer examination of the responses in the ARS-30 indicated that the mean scores of several statements such as "I would work harder", "I would see the situation as temporary", "I would try different ways to study", and "I would look forward to showing that I can improve my grades" were relatively high, ranging from 5.51 to 5.68. The university has provided additional support to students during the pandemic, including a lower weightage assigned to summative assessments, counseling services for students who were emotionally drained, remotely learning with regular tutors' support, deferred or installment payments of tuition fees for students who were unable to pay promptly due to loss of jobs or reduced income suffered by their parents. The support provided may have motivated the students to stay resilient.

Based on the responses gathered from the CCS, it appears that the campus connectedness among students during the pandemic was moderate, and there was no significant difference between male and female students. This could be attributable to the fact that the Ministry of Education has implemented a mandatory lockdown period for schools in Singapore between April and June 2020, where home-based learning took effect for all students (Gov.sg, 2020). The university adhered to the government policies and, taking into consideration of the students' safety, most of the lessons will be conducted online with restrictive campus access between June and October 2020. The respondents felt isolated during these periods as evidenced from their responses for items in the CCS, including "I have no sense of togetherness with my peers", "There is no sense of brother/sisterhood with my college friends", "I feel disconnected from campus life", and "I don't feel I participate with anyone or any group". Due to travel restrictions imposed by many countries and Singapore, there was a decline in the admission of international students. Consequently, this has restricted the opportunity for the local students to interact and learn from a diverse group of students from different countries, which may have contributed to a low scoring for "I feel so distant from other students" and "I am able to make connections with a diverse group of people".

The findings from this study indicated that there was no significant difference between the number of years enrolled in the university and the level of academic burnout, resilience level, and campus connectedness level. The findings suggested that fourth-year students experienced a high academic burnout and resilience level as they reported the lowest mean scores. This may be attributable to the fact that these final-year students were worried about graduates' job prospects amid the pandemic (Teng & Ang, 2020; Teng, 2020). Conversely, first-year students reported the lowest level of academic burnout during the pandemic. As these students just started their undergraduate studies with a relatively lighter workload and many of the modules were not examinable, they may experience a somewhat

lower level of academic burnout. In addition, they will not be entering the job market or looking for internships (which usually takes place in the second and third year of studies). Thus, they are not subject to the pressure of looking for full-time jobs faced by the graduating students. With regard to campus connectedness, Karhbet (2015) found that there is a positive relationship between the years of enrolment with the university and the level of campus connectedness. However, the findings in this study reported otherwise, where the level of campus connectedness declined from the second year onwards. One possible reason could be that many of the students had internships in their second, third and fourth year, and thus reported a relatively lower level of campus connectedness. In addition, some of the students were taking more electives in their third and fourth year of study, where most of these electives were having online classes, thus reporting a lower level of campus connectedness among these groups of students.

The findings of this study indicated that academic burnout was negatively associated with resilience level and campus connectedness. Home-based learning and lockdown measures imposed by the government may threaten university students' mental anxiety and emotional health, impacting their academic performance and educational progress (Al Omari et al., 2020; Husky et al., 2020; Singh et al., 2020). Adequate personal resilience and support from schools are crucial for the students to cope with the adverse effects brought by the pandemic (Elmer et al., 2020; Liang et al., 2020; Ye et al., 2020). The findings also reported a positive association between resilience level and campus connectedness, which is consistent with the results reported by Pidgeon et al. (2014). Prior studies reported that campus connectedness is often regarded as a positive contributor to students' academic resilience and motivation to excel in their studies, especially those in their transition to university (Lee & Robbins, 2000; Pitman & Richmond, 2008).

Implications and recommendations

As Singapore is approaching a new normal in the post-Covid-19 era, there is a need for the university to consider education anew given the emerging opportunities and challenges (Cahapay, 2020). Prior studies found that students suffered from mental stress and anxiety of varying degrees brought by the pandemic, which have a significant impact on their learning and academic performances (Aristovnik et al., 2020; Copeland et al., 2021; Essadek & Rabeyron, 2020; Li et al., 2020; Savage et al., 2020). During the lockdown period, students are expected to take their assessments at home or remotely. To reduce students' anxiety and academic burnout, the university may consider reviewing the curriculum and assessment that suit a blended learning environment. While recognising the importance of having assessments that align with the learning outcomes, scholars argued that the opportunity to learn (OTL) is perceived as a threat to test scores' reliability and comparability (DePascale & Gong, 2020; Keng & Marion, 2020). To minimise OTL loss caused by Covid-19 related stress and to take into consideration of diverse cultural, social, and learning abilities of students, the assessment committee may review existing literature to identify operational psychometric procedures

and redesign assessments that integrate theoretical concepts and job-related skills, knowledge, and abilities with evidence of fairness, reliability, and validity (Keng & Marion, 2020). In addition, the university is mindful that the assessment activities need to align to the module learning outcome and should be cognizant of connectivity, equity, security, privacy concerns, and are easily administered under different modes such as on-campus and remotely or virtually at an off-campus location (Jimenez, 2020; Khan & Jawald, 2020; Wiley & Buckendahl, 2020). Assessment design to shorten the feedback loop, minimise cheating, and secure assessment content is crucial (Arbuthnot, 2020; Langenfeld, 2020). The switch to online assessments saw "test pollution" where students were worried about their academic performance, which may lower their overall Grade Point Average as they are forced to learn and be assessed in a different method from the traditional final exam (Chalak & Tavakoli, 2010; Middleton, 2020). Prior studies reported that online remote proctored assessments created undue pressure (Lilley & Barker, 2016; Stowell & Benenett, 2010), invasion of personal privacy (Weiner & Hurtz, 2017), and students' withdrawal (Karim & Behrend, 2014). The university may employ a Multi-tiered Systems of Support or Response-to-Intervention framework to identify students who may need urgent intervention to help them cope with their learning caused by the assessment changes (Wyse et al., 2020). Additional support is given to students from low-income families where laptops and internet access are provided to ensure fairness and equity for online learning and assessments (Langenfeld, 2020).

The university may also invest in training and development for the faculty on online classroom facilitation and students' management. Instructors need to show more empathy for students facing academic burnout and emotional stress caused by the pandemic. More support such as hotline support, counselling and mentoring may be provided to students with high absenteeism rates or who have suffered a decline in interest in studying. Career coaching may also be provided to students facing challenges in resume writing and interviews, both remote and physical. Further, the university may also invite mindfulness and positive psychology practitioners to offer students advice on coping with stress and academic burnout during the pandemic.

As the pandemic situation improves, the university may gradually implement a hybrid learning model where students may be divided into two groups: one having physical class and the other attending lessons remotely and switching the two groups on a weekly or monthly basis. This may promote campus connectedness with more physical interaction between students and faculty members and also among themselves. Subject to social distancing and safety measures imposed by the government, the university may also raise students' campus connectedness by organising social events such as fundraising, performances, exhibitions, and career fairs within the campus to encourage students to participate.

Limitations and future studies

This study comes with a few limitations. First, the sample was selected from a single university and focus entirely on full-time undergraduates. Thus, the findings are not representative of students from other universities and private higher education institutions in Singapore and other countries. Second, the study did not gather data from full-time and part-time postgraduate students who may possess a different level of academic burnout, resilience, and campus connectedness. Third, the study employed pure quantitative research with self-reported scales using three instruments that may be subject to response bias. Thus, further research, both quantitative and qualitative (interviews and focus groups), may be conducted to examine academic burnout, resilience level, and campus connectedness during the pandemic among full-time and part-time undergraduates and postgraduates in public universities and private higher education institutions. Students may be probed on their relationships with their classmates, faculty, administrative staff, family, and friends and what kind of support they require to cope more effectively during the pandemic. In addition, future studies could also examine to what extent the faculty members and other employees are coping well in schools during the pandemic. Since the variables in this study (academic burnout, resilience, and campus connectedness) may change over time, longitudinal studies may also be considered to evaluate students and faculty resilience levels during and post-pandemic.

Conclusion

Although more than 90 percent of the population have been fully vaccinated, the university continues to be vigilant, and strict social distancing measures are imposed on all students and staff in campus and classrooms. As the pandemic is far from over, the university will continue to devise strategies that provide students equal opportunities for online learning and assessment. The employment of technology for blended learning and online assessment will continue to play a pivotal role in a student-centric learning environment (Rajhans et al., 2020). The adoption of online modalities such as digitalised virtual classroom (Sintema, 2020), online education (Basilaia & Kvavadze, 2020), mobile learning (Naciri et al., 2020), and digital learning (Mulenga & Marban, 2020) may be the new standard in the post-pandemic era for the university. Ongoing emotional support and financial assistance to students, actively engaging with employers for internships, and full-time job opportunities remain the key priorities and commitment of the university.

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Emergency remote teaching or andragogical innovation? Higher education in Singapore during the COVID-19 pandemic

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Article Info

Abstract

Singapore higher education's intraperiod response to the novel coronavirus (COVID-19) pandemic was unique compared to other countries, being praised by the World Health Organisation (WHO) for its early response. Like many other countries, alarming growth in cases appeared, and careful strategies for the continuation of learning were implemented. This paper provides a critical case study and reflection-in-action (Green et al., 2020) of the Singaporean intraperiod response, exploring individual responses from a sample of six autonomous universities, two international universities with campuses in Singapore, and four Private Education Institutions. Through a defined qualitative content analysis of university documentation, scant academic literature, and government and media sources, an understanding of the pandemic response in Singapore was possible. We chose to ensure full coverage of the city-state to enable a comprehensive country analysis in contrast to the growing volume of single-institution pandemic and emergency remote teaching case studies applying a sociotechnical theoretical framework to guide an analysis between educational technology systems and the people using it to teach, work, and learn. This study identified that while tasks and technology were presented with depth, the social elements – people and systems – were often lacking accurate description. We discuss how this technical focus has practical and research implications, and how future research and university teaching and learning practice can better respond to future challenges through reflection of the sociotechnical perspective.

Introduction

The novel coronavirus (COVID-19) pandemic poses significant challenges and opportunities for higher education (HE) globally. There has been a rapid expansion in temporary or emergent digital delivery strategies to enable HE to continue to educate their students in periods of lockdown (or so-called 'circuit breaker' periods in Singapore). While each country and each university has had nuanced responses, internationally these have largely been grouped into three consistent responses of rapid adaptation (Crawford et al., 2020a). These include: (1) responding to minimum governmental regulations (e.g., physical distancing and maximum indoor gatherings); (2) delayed commencement of the next teaching period; and (3) digitalisation. For Singapore, this initially largely resulted in digitalisation.

There has been a progression towards localised education models to support the temporary period of reduced international access to education and travel (Bonk et al., 2020). For institutions relying heavily on international students, especially in the three main HE import countries (the U.S., the UK, and Australia), there have been drastic social and economic challenges (*The Economist*, 2020; Marshman & Larkins, 2020). The Singapore education sector has not faced the same drastic challenges, with the majority of HE students being domestic and overall, HE demand exceeding supply, particularly in the Autonomous Universities (AUs). In the Singapore context, Autonomous Universities refer to corporatized, not-for-profit universities that are autonomous in the sense that they are heavily government-funded, yet have flexibility to decide on matters such as their internal governance, budget utilisation, tuition fees and admission requirements (Ministry of Education [MOE], Singapore 2005, Mok, 2010).

Thus, Singapore was not as adversely affected as countries where partial, and often over-, reliance on international students is key expansionary business. This major difference presents Singapore as a largely unique case study compared to the traditional three responses observed across international learning and teaching. In particular, a focus on domestic consumption of education mitigates the needs for government lobbying for border easing (ICEF Monitor, 2021; Ziguras, 2021), establishing quarantining arrangements for new and existing international students in Japan and New Zealand (Kakuchi, 2021), and allowing legislative changes to allow international student visas to be fulfilled without entrance to the country (Tudge, 2020).

The research objective of this paper is to examine the Singapore response to date in-depth. There are a number of studies with single institutional responses (e.g., Cleland et al., 2020; Compton et al., 2020; Fung & Lam, 2020; Goh & Sanders, 2020; Müller et al., 2021; Rai, 2020). There is also a survey of adult educators' perceptions towards their 'digital resettlement' during lockdowns and beyond in Singapore (Watermeyer et al., 2021a) and there are some articles that co-present Singapore's HE with other jurisdictions (Crawford et al., 2020a; Bonk et al., 2020; Kefalaki et al., 2021; Rudolph et al., 2021). Consequently, more cross-cultural and cross-institutional studies are needed (Crawford et al., 2020b). This manuscript focuses on analysing a sample of institutions within the Singaporean HE environment with a focus on the Autonomous Universities (AUs). The value of this research is in the opportunity to examine the synergies of responses when international student load is not a primary driver for rapid adaptation. We propose two research questions to guide our research:

> Research Question 1. What was the intra-period Singapore higher education response to COVID-19?

> Research Question 2. How does an understanding of COVID-19 responses change at institution and country-level analyses?

To examine these research questions, we have organised this manuscript in the following way. First, we begin with an overview of the Singaporean HE and COVID-19 contexts. Next, we provide an overview of the method adopted for this qualitative content analysis, and a presentation of the findings at the institutional level. Finally, we discuss the synthesis of these findings and consider the practical implications and opportunities for future research in our conclusions.

Brief literature review and context

Singapore and higher education

Since its independence in 1965, Singapore has continued to value education as a key social and economic driver. In 1976, only 16 percent of high school leavers pursued post-secondary education (Sam, 2017). At present, more than 40 percent cohort participation of Primary One students (who are typically seven years of age) in the Autonomous Universities alone is eventually achieved (Davie, 2020; Leow, 2020a; Ministry of Education, 2018).

Singapore's higher education includes diverse types of university offerings: local autonomous universities (AUs); international university transnational satellite campuses; and private education institutions (PEIs). PEI's in Singapore are non-government funded education providers that oftentimes offer post-secondary education, leading to the award of certificates and diplomas (Sam, 2017). The latter model frequently involves providing transnational higher education programmes via cooperation with international universities, ranging from fly-in faculty with full control to models with full local faculty. PEIs occupy a unique facet of the education sector with a limited proprietary offering under the regulatory supervision of the government's SkillsFuture Singapore's (SSG) Committee of Private Education (CPE) (Skills Future Singapore, 2020b).

In Singapore, there are six AUs, eight international branch campuses (IBCs), and 329 PEIs (Lo, 2017; Skills Future Singapore, 2020a; Immigration and Checkpoint Authority, 2020). Out of 329 PEIs, only approximately one third are permitted to offer external degree programmes through EduTrust certification (Skills Future Singapore, 2020b).

Singapore's positioning as a 'Boston of the East' and a 'Global Schoolhouse' to capture a growing global HE market has been socially and economically successful (Ye, 2016). Singapore's Global Schoolhouse project was started in 2003 with the aim of attracting world-class universities (Garrett, 2005; Lo, 2017; Ng & Tan, 2010; Waring, 2014; Ye, 2016;). Initially, the project was dominated by research-intensive American institutions (e.g., Johns Hopkins University and the Chicago Graduate School of Business: Sidhu et al., 2011). Additionally, Wharton Business School was contracted to provide expertise in setting up Singapore's third university, Singapore Management University (SMU: Sidhu et al., 2011), and MIT collaborated with the Singapore University of Technology and Design (SUTD) from 2010 to 2017 (SUTD, 2017). International diversification led to the transnational campuses of INSEAD (a highly-ranked French business school) and the Indian Jain School of Management establishment (Sidhu et al., 2011).

Higher education and COVID-19

In early 2020, Singapore's use of public health best practices in response to the novel coronavirus (COVID-19) pandemic had garnered praise from the World Health Organisation (WHO) and international media (Vaswani, 2020; Evers, 2020). The intraperiod response from Singapore was influenced by early detection and high sanitisation and social distancing efforts, compared with other countries. Universities remained open, teaching either fully online or through blended learning approaches. In the second quarter of 2020, the rate of new infections increased alarmingly, especially among foreign workers staying in dormitories (Bonk et al., 2020). As of 15 February, 2022, there were 514,000 cases and 926 deceased in Singapore, contrasted to global numbers of 415 million cases and 5.84 million deceased (COVID-19 SG, 2022; Global COVID Dashboard, 2022).

Prior to the circuit breaker, Universities made a preliminary response by delivering all learning activities online and converting summative assessments (e.g., invigilated examinations) into a variety of online or take-home modalities. The Singapore government's technocratic approach to COVID-19 began after an initial circuit breaker (lockdown) had been imposed to contain the spread of COVID-19 from 7 April to 1 June, activities within Singapore were planned to be resumed gradually over three subsequent phases: safe reopening, safe transition, and 'the new normal' (Ministry of Health, 2020a). At the time of writing (February, 2022), the city-state is in Phase 3, after having had to go back to Phase 2 (heightened alert) from 22 July to 18 August, 2021 (gov. sg, 2021). A brief overview of these phases is provided for context.

Phase 1 ('safe reopening': 2 - 18 June, 2020) saw the recommencement of low risk economic activities. This included higher education institutions whose terms were in session returning to campus for practical and laboratory-based sessions, with instructional learning remaining online. However, co-curricular activities, enrichment activities and tuition were not to resume (Ministry of Health, 2020a). In Phase 2 ('safe transition': 19 June - 27 December, 2020), some medium risk economic and social activities have

resumed (Medina, 2020). Phase 3 (the 'new normal': from 28 December, 2020 onwards) is still ongoing. Among other things, Phase 3 involves the gradual re-opening of Singapore's borders (Ministry of Health, 2020b; Medina, 2020).

Dependence on international students is marginal. 104,000 students were enrolled in AUs in 2018 (data.gov.sg, 2019); foreign campus universities and PEIs are excluded from these numbers. Such differences to other countries are balanced by different government policy landscapes that create environments to incentivise international places (e.g., less domestic funding). From 2020 onwards, the cohort participation rate in AUs was higher than the original target of 40 percent, due to the pandemic (Davie, 2020; Leow, 2020a; Ng, 2021). This is contrasted to Australia (Yezdani, 2021), United Kingdom (Britton et al., 2020), and United States, that are currently responding to the effects of challenging transnational education and reduced international student intakes on institutional bottom-lines.

Strong domestic demand for local university places and the politicisation of the composition of the student population has resulted in most places at the AUs being domestic (Loke & Gopinathan, 2017; Davie, 2021; Ng, 2021). Proportions in 2012 and 2015 were consistent, with only 15-16 percent in international students in the Autonomous Universities with capped foreign intake at 2011 levels and while expanding domestic university places (Henson, 2015). In 2016, 77,000 Singapore residents and 29,000 foreigners attended Private Education Institutions (Lee, 2016). In 2020, 35 percent of the 68,200 foreign students studied at PEIs (Leow, 2020b). The number of international students had fallen from 89,400 in 2012 to 67,200 international students in 2019 (Leow, 2019, 2020b; Sharma, 2019). The cohort participation rate in Singapore's autonomous universities reached an all-time high of 42% during the pandemic in 2020 (Loke & Gopinathan, 2017; Davie, 2021). In 2020, Singapore's six autonomous universities increased admissions by 2,000 offers, and in 2021, by an additional 1,000 places, while upholding admission standards and ensuring a quality education (Ng, 2021). The increase in demand for places in domestic universities was largely due to Singaporeans' being less inclined to study abroad as a result of the pandemic, rising anti-Asian hate crimes and deferring work due to a weak job market (Ng, 2021; Davie, 2021).

Singapore presents a unique case study for COVID-19. During the pandemic, there are numerous published examples of universities globally experiencing financial difficulties (e.g., Marshman & Larkins, 2020; Wang et al., 2020), often from decreased international student intake. In Singapore, there has been minimal reporting of educational institutions experiencing COVID-19-based financial difficulty. There is no shortage of international students who would like to study at the AUs, with some 25,000 applications for 3,000 international places each year (Sam, 2017). Despite this, AUs often charge double for international students, whereas PEIs do not typically have much price differentiation at all for domestic and international places (Sam, 2017). While major HE-exporting nations like Australian, UK, and the U.S.-based higher education are focusing on decisions partially based on cost-savings (see Yezdani, 2021), low-income countries

are avoiding online learning considering cost of electricity, data, and learning devices on student communities (Kuguyo et al., 2020). For Singapore however, higher education communities are articulating a 'paradigm change' and 'education without limits' mentality, characterised by a future-focused digital mobility and innovation over dollar savings (Fung & Lam, 2020; Watermeyer et al., 2021a).

Theoretical framework

The socio-technical systems framework was described by Lewitt (1965) as two independent but interrelated systems – the social and the technical. The social system is broken into people (attributes, knowledge, skills, values, and needs) and organisational structure (authority structures, reward systems, and policy), whereas the technical system is divided into tasks (processes performed by humans or machines) and technology (hardware, software, or facilities) (Bostrom & Heinen, 1977; Oosthuizen & Pretorius, 2016). The socio-technical systems framework focuses on how interactions between people and technology are shaped, and how applying it may help ensure that technical solutions meet social requirements (Coiera, 2006; Li et al., 2019). The framework aims to understand how the social system contributes to the performance of the technical system, also in light of the "poor acceptability, uptake and performance" of many information and communication technology (ICT) innovations (Coiera, 2006, p. S98). Recognising that both social and technical systems have mutual systemic consequences and are thus intrinsically entwined, the framework can thus contribute to the process of developing higher-performing ICT systems (Coiera, 2006). While this framework has been adapted over time, this original framework with four attributes is still applicable today to identify the joint optimisation of both systems to solve complex issues, such as during the implementation of a technology or design-led change (Oosthuizen & Pretorius, 2016; Sony & Naik, 2020).

Within higher education, there is limited application to date of the socio-technical theoretical framework to learning and teaching. There are studies thatv discuss the opportunity to adopt the socio-technical approach to consider the efficacy of e-learning (Upadhyaya & Mallik, 2013) and distance education (Wang et al., 2010). However, there are limited other applications in higher education. Despite this, there is extensive evidence about the effect of the online learning systems (technology) on the student (people) learning experience (task) when implemented as an organisation-wide (structure) policy (Kebritchi et al., 2017; Nortvig et al., 2018). With emergency remote teaching introduced to replace face-to-face teaching in classroom environments in early 2020, academic staff and students in Singapore and elsewhere had to adapt quickly to a complex technical system. The socio-technical systems framework provides a sound structure for analysis of higher education's response to the pandemic. Applying the four attributes of the framework: people comprises the attributes, skills, values, and needs of students and academics; structure comprises policy, support, and incentives; technology includes hardware, learning systems, teaching software, web resources, and other technologies; and, tasks include design, instruction, assessment, and evaluation.

Method

To support the research objectives of this study, a multiple-unit case study method adopting a qualitative content analysis was employed (Mayring, 2004). This comprises 12 individually reviewed educational organisations at an institutional level that are subsequently synthesised within-case at the national level. Our content analysis approach includes quality assessment of information sources, given access to peer-reviewed information is restricted by such sources only just beginning to be published. For transparency, we used 141 sources, and provided a summary of sources used in Table 1. Direct university and government sources (43.1%) are supplemented by news articles, higher education news outlets, and other forms of communication. In Singapore, all but one mainstream newspaper are owned by one company, Singapore Press Holdings (with the Today newspaper owned by Mediacorp – Edge, 2004). These newspapers are of a pro-government-nature and they are extremely unlikely to misquote government sources. The goal was to ascertain information regarding how such institutions were progressing through the pandemic – using an iterative analysis of documents – and the locations these were published are not always traditional sources (e.g., institutional blogs).

Table 1: Source types.

Source type	Examples	N	%
HE institution website	Nanyang Technological University	44	31.2
Academic journal articles	Journal of Applied Learning and Teaching	31	21.9
News articles	*The Straits Times*	20	14.2
Government website	Government press releases	11	7.8
HE institution communications	Direct emails to student cohorts	7	5.0
Blogs	Mothership	3	2.1
Academic Books		3	2.1
Report		2	1.4

In terms of institutional selection, we included all six Autonomous Universities for the purpose of this article. It was obviously not possible to discuss the approximately 300 Private Education Institutions, and instead the largest four by student population were included (SIM Global, Kaplan Singapore, PSB Academy and MDIS). There are eight

international branch campuses in Singapore, and a group of two universities were selected to include James Cook University and INSEAD based on student population size and institutional ranking, respectively. Table 2 provides a high-level summary of the institutions included. The rationale for this purposively selected sample of 12 institutions was to present the full diversity of Singapore's higher education offerings by having all three delivery models represented. To address the research questions of this study, we adopted purposive (non-probabilistic) sampling, with the focus on getting a maximal variation (Patton, 2002) of voices, through analysing the responses of six AUs, two IBCs and four PEIs (n = 12). Purposive sampling does not aim at being representative or being generalisable (Campbell et al., 2020), thus limiting its external validity (Etikan et al., 2016; Andrade, 2021).

Table 2: Basic statistics of selected institutions offering HE in Singapore in 2020.

Type *	Institution	Established	Staff	Students
AU	National University of Singapore (NUS)	1980	10,200	42,600
	Nanyang Technological University (NTU)	1991	8,300	32,000
	Singapore Management University (SMU)	2000	600	22,800
	Singapore University of Social Sciences (SUSS)	2005	1,400	15,000
	Singapore Institute of Technology (SIT)	2009	500	7,000
	Singapore University of Technology and Design (SUTD)	2009	600	400
PEI	Singapore Institute of Management (SIM)	1964	n.a.	17,200
	Management Development Institute of Singapore (MDIS)	1956	n.a.	13,000
	PSB Academy	1964	n.a.	>12,000
	Kaplan Singapore	1989	300	12,000
IU	James Cook University Singapore (JCU)	1970	n.a.	4,200
	The Business School of the World (INSEAD)	1957	300	1,400

*PEI = Private Education Institution, AU = Autonomous University, IU = International University

For Table 2, staff and student numbers are rounded to the nearest 100. Sources: INSEAD, n.d.a; Kaplan Inc, 2021; James Cook University, 2020c; Nanyang Technological University, 2020a, 2020b; Management Development Institute of Singapore, n.d.; National University of Singapore, 2020a; Singapore Institute of Management, 2020a; Singapore Institute of Technology, 2020b; Singapore Management University, 2020a, 2020b; Singapore University of Social Sciences, 2020c; Singapore University of Technology and Design, 2020g; PSB Academy, n.d.

Results

This section commences with a brief overview of the response to the pandemic from the institutions included in our sample (see Table 2). There have been three types of rapid adaptation identified (Crawford et al., 2020a), although only rapid digitalisation was identified in this article's sample. We also articulate the date of the first rapid adaptation, where this was available (see Table 3). In addition, we have taken into account a constructive alignment lens (Biggs & Tang, 2011; Biggs et al., 2019) in considering assessment and learning activity changes. We acknowledge the role of intended learning outcomes (ILOs) in these discussions. However, the published literature does not speak to changes in this regard and they were thus not typically identified explicitly through our qualitative content analysis.

Autonomous universities

National University of Singapore (NUS)

After the end of the circuit breaker on 2 June 2020, the National University of Singapore (NUS) embarked on controlled resumption of learning activities safely (Ministry of Health, 2020a). Instructional learning continued as pre-recorded and online for flexibility and accessibility. Use of project management and polling apps facilitated teaching methods such as group projects to allow peer-to-peer and peer-to-teacher synchronous communication. The changes made to assessments and examinations enabled student flexibility in managing which subjects applied to their Grade Point Average (GPA) (Yeo, 2020). NUS has incorporated innovative and advanced technologies, virtual reality and AI to optimise the learning experience of the students (Sen, 2020). NUS has also applied learning analytics regarding student attendance and online access to improve remote learning (Madan, 2020; Sen, 2020).

The duration of Phase 2 lasted six months (19 June 2020 - 27 Dec 2020), and on 9 October 2020, NUS updated students about the relaxation of certain guidelines, such as: allowing co-curricular activities (CCAs) to gradually resume and in-class lessons with less than 50 students to resume. NUS also informed students that from 2 November 2020 onwards, students could return to campus regardless of whether they had lessons. As Singapore moved to Phase 3 in late December, 2020, NUS released a circular informing students that resuming in-class lessons would be encouraged and all safety measures would continue to apply until further notice (National University School, 2020b).

Nanyang Technological University (NTU)

Similar to NUS, NTU also allowed student choice for competency-based pass/fail grades for all semester 1 2020 undergraduate courses that began in August (Mahmud, 2020). However, NTU students faced several uncertainties. The university's first online adaptation was on 13 February, 2020. On 24 March, 2020, invigilated exams were converted to continual assessments causing some students distress and anxiety (Fan, 2020; Mahmud, 2020), as they feared failing

to meet the new deadlines and workload requirements. NTU also employs the Massive Open Online Course (MOOC) platform Coursera for up to 12 academic units (approximately four modules: Chia, 2020).

NTU made adjustments to its COVID-19 guidelines when entering Phase 3. Similar to NUS, classes with more than 50 students would still be conducted online whereas those below 50 students could return to in-class lessons. Students are still required to ensure safe distancing, wipe down tabletops after utilising them, and are encouraged to only enter school campuses when necessary (especially for tutorial and lab lessons). CCAs are to resume progressively (requiring booking) with safe distancing measures (Nanyang Technological University, 2020c, 2020d).

Singapore Management University (SMU)

Singapore Management University (SMU) moved selected classes to online learning on 10 February, 2020, and subsequently, added new educational technology to support and facilitate an online curriculum (SMU Engage, 2020). The university revamped its IT system support to facilitate fully online learning formats by 30 March 2020; all academic materials were available through its learning management systems.

For students who were completing their graded assessments and preparing for invigilated examinations, the institution changed its modality to online examinations with providing students flexibility to choose a diverse range of grading options. Such measures were aimed at minimising any delay to student progression, and reduce student stress and anxiety. Following governmental post-circuit breaker strategy releases, SMU announced its resumption of traditional operations in August 2020. The majority of instruction and learning activities remain conducted online, with only a proportion of courses adopting blended and flipped approaches. For these courses, partitions of the cohort may attend in person while the rest continue online learning over one- and two-week cycles (Clark, 2020; SMU Engage, 2020).

SMU introduced a Day Pass Entry Registration System which allowed students the flexibility to enter school premises on days they do not have classes in order to access the library and do printing (Singapore Management University, 2020c). Similar to other AUs, classes with up to 50 students were to be held fully on campus starting January 2021. SMU would gradually allow for all lessons to be conducted physically, and international students were to make travel plans back to Singapore before the start of the term (starting 11 January 2021: Singapore Management University, 2020c). Examinations were also to be reintroduced to campus gradually.

Singapore Institute of Technology (SIT)

Singapore Institute of Technology (SIT) implemented e-learning from 24 February 2020 for classes with more than 50 students, and has been garnering positive responses from both students and lecturers, as an effort to reduce physical contact amongst the university (*Channel News Asia*, 2020; Singapore Institute of Technology, 2020a). Despite having competencies in utilising the following digital platforms of live-streaming, pre-recorded instructional workshops, and facilitating discussions digitally, faculty members and students required additional preparation to embrace and transition to online learning (Lim, 2020). SIT attained the licenses to digital platforms such as Zoom, Microsoft Teams, and Respondus for both students and lecturers, which allowed flexibility to apply appropriate platforms for educational purposes, with student usage guidance. Laboratory workshops were continued in small groups in line with government policy. For the students in quarantine or on leave of absence, the university provided alternative learning instruction and activities online (Lim, 2020). SIT's success in its transition amidst the pandemic was perhaps due to understanding students' concerns prior to the implementation of remote learning. SIT had previously surveyed their student cohort regarding concerns and challenges when engaging in online learning. Responses from students included querying the effectiveness of online lectures, suggesting changes in assessment, and their realisation that online learning required greater self-discipline (Lim, 2020).

From 7 September 2020 onwards, SIT welcomed its new cohort of students on campus for lessons, CCAs, and various activities. The school stepped up on ensuring cleanliness of the campus and a team of Safe Management Officers and Safe Distancing Ambassadors were deployed to help everyone keep to the safe management measures as the campus reopened (Singapore Institute of Technology, 2020c).

Singapore University of Social Sciences (SUSS)

On 6 April 2020, Singapore University of Social Sciences (SUSS) suspended its campus learning and teaching and implemented full campus closure from 7 April 2020. To ensure continuity of learning and teaching, the university implemented new operational plans during the duration of campus closure. All on-campus examinations were replaced with timed online assessments (Singapore University of Social Sciences, 2020a). Such measures continued after the reopening of the campus on 19 July 2020 (Singapore University of Social Sciences, 2020b). The University and its partnering organisations offered 14 free online courses on SUSS's UniLEARN platform, an e-learning initiative for continued learning experiences of its community. The platform emphasises social and workplace skills to empower its community to grow within their personal and professional capacity during this challenging time. For a period of time, the courses were freely accessible to the public in areas such as wellness, digitalisation and business management (Singapore University of Social Sciences, 2020d).

The SUSS campus reopened on 12 October 2020. However, only authorised staff and students were allowed on campus. Temperature checks and online health declarations were prerequisites for access. Students were required to present lesson schedules to Safe Management and Security Officers

who enforced contact tracing and safe distancing measures (Singapore University of Social Sciences, 2020b).

An amount of $1 million was raised by the University to aid students who encountered financial difficulties due to the pandemic. This allowed some 400 students to continue payment of their school fees despite income losses. SUSS also supported their alumni through programmes such as the Venture Builder programmes, aimed at cultivating an entrepreneurial spirit in addition to specific career guidance and professional grooming to boost employability (Singapore University of Social Sciences, 2020e).

Singapore University of Technology and Design (SUTD)

Singapore University of Technology and Design (SUTD) closed its campuses from 8 April 2020, and implemented e-learning strategies. SUTD adopted digital platforms like eDimension which complement teaching and learning, facilitate communication, and enable content creation and collaboration (Singapore University of Technology and Design, 2020b). The Learning Catalytics as well as the Subject and Instructor Evaluation platforms facilitate synchronous course feedback, while the Respondus Lockdown Browser aims to ensure academic integrity during online exams (Singapore University of Technology and Design, 2020c, 2020d, 2020e). SUTD also uses Academic Media Studio, an online learning environment, to facilitate student audio and visual learning projects (e.g. recordings). 2 June 2020 saw SUTD announce a gradual return to campus, with authorised students allowed to return for assigned classes or laboratory work (Singapore University of Technology and Design, 2020f). However, the new academic year started in September 2020 with home-based learning as the new norm.

SUTD started increasing on-campus activities from 28 September, 2020, with staff divided into teams and returning to campus every other week. Employees were to adhere to safe distancing measures, temperature checks, health and travel declarations. Online meetings remain highly encouraged. Safe Management Officers were deployed to facilitate contact tracing and maintain a safe working environment (Singapore University of Technology and Design, 2020f).

International branch campuses

James Cook University Singapore (JCU)

In 2018, James Cook University (JCU) Singapore had 3,500 students – 60 percent were international students (Leow, 2020b). JCU suspended all teaching for a week from 23 March 2020 to enable the lecturers to prepare for transition to online learning. By 30 March 2020, instruction and learning activities were largely digitised, with fully online delivery from 6 April 2020 (James Cook University Singapore, 2020c). JCU began its new semester (March 2020) with home-based learning through the learning management system, LearnJCU built on Blackboard's Learning Management System. Lecture materials, readings, collaboration tools, and information about their subjects, assessment information and outlines

Table 3: Institutional responses to Covid-19 within the sociotechnical framework: autonomous universities.

Institution	First adaptation of e-learning	Structure	People	Technology	Tasks
NUS	10 Feb	Singapore government (specifically, MOE) dictates specific policies during the COVID-19 period.	NUS recognised that the pandemic posed a serious health crisis and thus acted in a particularly student-centric manner. Academics had to work hard to ensure that emergency remote teaching was feasible. During the three phases thus far, blended learning became more routine and both students and academics have become increasingly well-versed in it.	Learning activities were converted online using platforms such as Zoom and Canvas. Lectures were pre-recorded.	Invigilated exams were converted to online examinations, or continual assessments such as quizzes, projects, and other assignments. Undergraduate courses included competency-based assessment for interim grading.
NTU	13 Feb	See above.	Similar observations as for NUS (see above) can be made. Students were able to seamlessly transition from traditional classes to online classes.	NTU additionally engaged in online learning via the Massive Open Online Courses (MOOCs), specifically Coursera.	Invigilated exams were converted into continuous assessments such as quizzes, projects, and other assessments. Students could attain certification for selected courses at no extra cost, and these could be taken even while in an internship or overseas exchange. The use of MOOCs allowed students to attain knowledge and graduate without delay.
SMU	10 Feb	See above.	Similar observations as for NUS (see above) can be made.	All learning activities were converted to online platforms using WebEx, videos and eLearn. SMU also ensured that students were aware of the channels and resources available, should they encounter challenges in their learning experience.	Invigilated exams were converted into continuous assessments such as quizzes and projects. SMU decided to exercise the Satisfactory/Unsatisfactory (S/U) option for all undergraduate courses taken in the semester between August 2020 and January 2021.
SIT	24 Feb	See above.	Similar observations as for NUS (see above) can be made.	All learning activities were converted online using digital platforms such as Zoom, Microsoft Teams, and Respondus. The variety of online platforms utilised was to provide students options in choosing the most appropriate platform to work with.	Invigilated exams were converted into continuous assessments such as quizzes and projects. Learning was executed via digital platforms with live streaming, pre-recorded teaching sessions, and facilitating discussions digitally.
SUSS	24 Mar	See above.	Similar observations as for NUS (see above) can be made.	All learning activities were converted online, using Zoom with an integrated Canvas learning management system, which offers an easy-to-use interface and real-time online classes.	Invigilated examinations were converted to online timed exams. Digital learning allowed an easy-to-use interface and real-time online classes.
SUTD	24 Mar	See above.	Similar observations as for NUS (see above) can be made.	All learning activities were converted online through Blackboard. SUTD uses the digital platforms of eDimension, Learning Catalytics, Subject and Instructor Evaluation, and Lockdown Browser, to maximise the interaction and learning experience of the students and to also ensure the academic integrity of assessments.	All exams were converted to online or continual assessments such as quizzes and projects.

Sources: Channel News Asia, 2020; Chia, 2020; Clark, 2020; Fan, 2020; Hutton, 2020; Lim, 2020; Mahmud, 2020; Ministry of Education, 2020; Sen, 2020; Singapore Institute of Technology, 2020a; Singapore University of Social Sciences, 2020a; Singapore University of Technology and Design, 2020a, 2020b, 2020c, 2020d, 2020e, 2020f; SMU Engage, 2020; *The Straits Times*, 2020a; Yeo, 2020.

were primarily available through this medium (James Cook University Singapore, 2020a). JCU also adopted a different scoring system for first and second year subjects: students would be issued with competency-based satisfactory/unsatisfactory grades, with the exception of some degree programmes that continued with constructively aligned rubric-based grading due to professional accreditation requirements. Third and final year subjects applied the standard grading system (James Cook University Singapore, 2020b).

JCU continued with blended learning as Singapore moved from Phase 2 to Phase 3. Students were to have lessons either on campus or online. From 29 June 2020 onwards, both students and staff were allowed to return to campus. Facilities and services such as the Learning Centre, the library, IT labs, science lab, aquaculture lab, trading room and counselling services were available on campus. Self-study on campus has also been allowed during operating hours. At present, only the gym facilities remain closed (James Cook University Singapore, 2020b).

INSEAD

Institut Européen d'Administration des Affaires (INSEAD), a world-class French business school that positions itself as the Business School for the World, converted all face-to-face delivery to synchronous online learning using Zoom in March 2020. Invigilated examinations were converted to online examinations and other learning resources (e.g., INSEAD Go-live) were accessible online (INSEAD, 2020a). INSEAD Go-Live emulates traditional classroom teaching online and engages students through breakout rooms and chats. Another function of Go-Live is that lecturers can easily view answers from every student in one glance (INSEAD, 2020b). For INSEAD's asynchronous Online Programmes, students have access to their Online Learning Platform which houses the content notes for the chosen programme as well as discussion forums (INSEAD, n.d. a). There was no information regarding any potential changes in the scoring system of the university.

In response to the COVID-19 situation, INSEAD formed the Crisis Management Taskforce (CMT) which consists of staff from multiple divisions. Members consult each other daily to monitor the pandemic, formulate plans of action and inform students and staff about any changes regarding the pandemic (Mihov, n.d.). Cleaning regimes and airflow have been amped up, with sanitisers dispersed throughout the campus and clean-as-you-go kits in lecture theaters. Food provided by INSEAD switched from buffet-style to prepared lunch boxes, and contact tracing, temperature checks and safe distancing measures were implemented in compliance with the local government (INSEAD, n.d. b).

On-campus activities and events from September to December 2020 were subject to approval by the Student Life Office. However, virtual alternatives must still be considered. From 2 September 2020, physical lessons were to resume and if not possible, lessons were to be conducted via Zoom. Students were given the choice to participate virtually but they had to provide a valid reason that was to be assessed for approval. INSEAD has introduced a module with one quiz on COVID-19 awareness for its students to finish in order to have campus access. Students also need to sign the INSEAD Community Commitment before they can be admitted to campus (INSEAD, 2020c). As a result of a student survey, the MBA programme which was set to begin on 21 August, 2020, was postponed to 5 October, 2020. INSEAD also trimmed the core curriculum for incoming students and lengthened the programme timeline to allow more time for elective credits (Bryne, 2020).

Table 4: Institutional responses to Covid-19 within the sociotechnical framework: international branch campuses.

Institution	First adaptation of e-learning	Structure	People	Technology	Tasks
JCU	30 Mar	Singapore government (specifically, MOE) dictates specific policies during the COVID-19 period.	Similar observations as for NUS (see Table 3) can be made.	All learning activities were converted online using LearnJCU, a virtual learning environment that is built on the Blackboard Learning Management System to support students' learning. JCU also utilises a personal learning space called PebblePad in Blackboard Ultra for students to complete their assessments in an interactive workbook.	Invigilated exams were converted into continuous assessments such as quizzes, projects, and other assignments. The university had replaced its mid-term examination with non-invigilated examinations or a written assignment, and final examinations were replaced with alternative assessments submitted via their Learning Management System (LearnJCU).
INSEAD	Mar	See above.	See above.	All classes were converted online and students were expected to access all course materials online, participate in classroom discussions, and stream videos (Zoom). All learning activities were converted online using Zoom. The school also took the initiative to organise events with speakers from around the world, and hosting webinars, connecting students with virtual project opportunities.	Invigilated exams were converted into continuous assessments such as quizzes, projects, and other assignments. Students were to complete and submit online assignments and tests through INSEAD's online platform.

Sources: INSEAD, 2020a, 2020b; James Cook University, 2020a, 2020b, 2020c; Lim, 2020; Ministry of Education, 2020; *The Straits Times*, 2020.

Private education institutions

Kaplan Higher Education Singapore

Kaplan Higher Education Singapore, with 12,000 students (approximately 25% international: Leow, 2020b), collaborates with ten different university partners on external degree programmes and also offers its own proprietary programmes. The responses from Kaplan varied depending

on partner university requirements. Kaplan Singapore's largest university partner, Murdoch University (Australia), is the focus of this section. On 27 March 2020, Kaplan notified all Murdoch University students of the digitalisation of all instruction and learning activities due to COVID-19. The students in the first trimester of 2020 were taking their lessons on-campus from 1-7 April 2020, and were given the option to attend lessons through synchronous live-streams on Zoom or continue on-campus lessons (Kaplan email circular, 27 March 2020). On 3 April 2020, students were notified of campus closure from 4 April, with all lessons to be digitised using Zoom (Kaplan email circular, 3 April 2020). Changes were made to invigilated examinations to include flexible timed online examinations (asynchronous and synchronous), and take-home exams (Kaplan email circular, 4 April 2020). For student failures, the grade was to be withheld from their Academic Transcript and Grade Point Averages (GPA) (Kaplan email circular, April 4, 2020). As of 13 April 2020, online learning was confirmed through Blackboard Collaborate with usage guidance (Kaplan email circular, 13 April 2020). As Singapore gradually exited the circuit breaker, Kaplan applied a phased approach to campus recommencement, and notified students that home-based learning would continue except for essential face-to-face study (Kaplan email circular, May 28, 2020). Finally, as Singapore progressed into the second phase from 19 June 2020 onwards, the institution announced its reopening from 29 June 2020. However, students were not required to go back to campus and online learning was continued (Kaplan email circular, 28 May 2020).

For 2021, Murdoch University and other partner universities of Kaplan continued to deliver its programmes online. Murdoch University also continued offering additional courses that are in high demand due to COVID-19: innovation, cyber-security and mental health are some example areas (*The Straits Times*, 2020b).

Management Development Institute of Singapore (MDIS)

The Management Development Institute of Singapore (MDIS) suspended all physical classes from 8 April to 1 June 2020 to decrease COVID-19 transmission (Management Development Institute of Singapore, 2020a). MDIS encouraged their students to stay at home and delivered their courses via their Blackboard Learning Management System (LMS). Students could also access an online library to supplement their learning during the circuit breaker (Management Development Institute of Singapore, 2020b). To relieve students of financial difficulties brought about by the pandemic, MDIS started the "MDIS Education Recovery Grant" for Singaporean Residents enrolling in programmes beginning 1 January 2021 through 30 June 2021 (Management Development Institute of Singapore, 2020c). The grant enabled undisrupted learning, upskilling and an easier adaptation period for students (Management Development Institute of Singapore, 2020d).

PSB Academy

PSB Academy which brands itself as 'The Future Academy' was engaged in online learning and teaching before the circuit breaker. The Academy fully transitioned to online learning from 1 April 2020 (PSB Academy, 2020a), so students could continue learning away from campus. Digital resources, student video consultations, online sessions with academics and student support services were provided for additional synchronous support (PSB Academy, 2020b). On 25 May 2020, the Academy announced that selected students would be allowed to return for specific learning activities (e.g. laboratory work), with the remaining learning and teaching continuing online. From 13 July 2020, PSB Academy increased on-campus activities progressively by resuming smaller classes, project work discussions, and academic consultations across both campuses (PSB Academy, 2020a).

From 21 September 2020, PSB Academy increased the frequency of physical lessons. Students previously needed to pre-book campus services, such as collecting certificates, payments and borrowing of learning resources, which was by then no longer necessary. Students were allowed to self-study individually at selected areas but were not permitted to mingle or linger. Meetings for graded group projects were permissible in certain areas which were available in two-hour reservation slots (PSB Academy, 2020c).

Singapore Institute of Management (SIM)

Like other PEIs, Singapore Institute of Management (SIM) also closed its campus and moved to full home-based learning from 8 April 2020 to 1 June 2020 to curb the spread of COVID-19. The school continued to engage students through the use of their Learning Management System (LMS) in delivering lessons (Hutton, 2020). The campus reopened from 13 July 2020 for selected learning activities and assessments (e.g. in-person training), with the balance remaining online (Singapore Institute of Management, 2020a).

SIM resumed in-person classes from August 2020 and students having in-person lessons had to provide proof of their class schedule. Otherwise, they were prohibited to be on campus. Online learning was to continue until further notice. Other safety measures continued to be adhered to: safe distancing, safe entry, small group gathering, washing of hands, and mask wearing (Singapore Institute of Management, 2020a). As of 4 January 2021, more services and facilities in SIM were made available (library, food and beverage, and retail) for students who made prior booking but mingling and loitering on campus was not allowed.

Table 5: Institutional responses to Covid-19 within the sociotechnical framework: private education institutions.

Institution	First adaptation of e-learning	Structure	People	Technology	Tasks
Kaplan	27 Mar	Singapore government (specifically, CPE) dictates specific policies during the COVID-19 period.	Similar observations as for NUS (see Table 3) can be made.	Zoom or Blackboard Collaborate. For instance, Murdoch University also used platforms such as Studiosity, Endnote, and Urkund to facilitate online learning	Invigilated examinations were converted to online examinations including take-home exams (usually for a duration of 24 to 48 hours); or flexible asynchronous and timed exams (e.g. a three-hour exam any time within a 24-hour window); or a timed synchronous examination.
MDIS	24 Feb	See above.	See above.	All classes were converted online and students were expected to access all course materials online, participate in classroom discussions, and stream instructional videos via Zoom. Students gain easy access to resources globally, and allow lecturers to address students' queries and needs more effectively	All course materials are to be accessed online, and to complete and submit online assignments and tests, as well as view grades and feedback through an online platform.
PSB	24 Feb	See above.	See above.	PSB Academy uses Blackboard Ultra to conduct online learning and the school also actively engages with its students through communication platforms such as email, Facebook, Wechat, Instagram and PSB Academy's website. All learning activities were converted online using the university's LMS.	All invigilated examinations were converted to online, assessments and activities were delivered online.
SIM	24 Feb	See above.	See above.	All classes were converted online using the institution's LMS. Students were expected to access all course materials online. All learning activities were converted to online.	All invigilated examinations were converted to online, assessments and activities were delivered online. Students who had examinations during this period were informed separately of alternative arrangements.

Sources: Lim, 2020; Management Development Institute of Singapore, 2020a, 2020b; Ministry of Education, 2020; PSB Academy, 2020a, 2020b; Singapore Institute of Management, 2020a.

Discussion

Autonomous universities

With local universities being labelled as Autonomous Universities in Singaporean nomenclature, one could expect their approaches to be independent from each other. In fact, their responses are quite similar. During the lockdown between 7 April and 1 June 2020, strong government directives led to a uniformity of responses: no face-to-face classes, rapid digitalisation with some learning management and videoconferencing software variance. Several universities used a fairly radical approach towards grading, adopting competency-based satisfactory and unsatisfactory grades, rather than employing a constructively aligned gradient.

With Singapore being, at the time of writing, in Phase 3 of reopening, there has been a gradual and incomplete return to face-to-face classes. However, online learning continues to be important, and the prevalence of blended learning has accelerated due to the pandemic.

International branch campuses

International branch campuses typically have more international students than the AUs. Their approaches were more varied than AUs (for instance, in terms of speed of conversion to online classes and potential changes in grading). Nonetheless, there are many similarities, such as a voluntary conversion to online and alternate forms of learning prior to the lockdown. This may be in part due to consistently applied management decisions from their home nation campuses where cases, and international revenue, were more dire. Similar to the AUs discussed in the previous section, a gradual and incomplete return to face-to-face classes within a blended learning approach could be observed by early 2021.

Private education institutions

The four selected PEIs often moved faster than the AUs and international branch campuses in moving online, perhaps because of them being smaller (especially in terms of permanent staff numbers) and more agile organisations. In conjunction with their partner universities, the PEIs had ready online strategies commencing Emergency Remote Teaching immediately from early April 2020.The PEIs have since moved to more systematic and robust pedagogical approaches to online learning. With the gradual and yet-incomplete reopening of Singapore's economy as of September 2021, PEIs have recognised that their focus will return to face-to-face delivery, but within a blended learning approach, not unlike the AUs and IBCs discussed in previous sections.

The Singaporean higher education experience

As explained in the Theoretical Framework section, we chose the socio-technical system as a theoretical framework. The socio-technical framework is surrounded by a complex environment which in our case is of course the pandemic. Tables 3, 4 and 5 show the differences and similarities in responses between the 12 selected educational institutions (six AUs, two IBCs and four PEIs) in response to the pandemic, and show the dates of their first adaptation across the selected 12 institutions. The tables also discuss the four aspects of the socio-technical framework (people, structure, technology and tasks) as much as possible within the confines of a qualitative content review.

The first adaptation of e-learning in response to the pandemic in the 12 institutions occurred within a relatively short window between 10 February and 30 March, 2020. All the dates were well before the circuit breaker (lockdown) that occurred in the city-state between 7 April and 1 June and show some foresight by the various institutions. In our

study, the people aspect of the socio-technical model largely refers to students and the staff (especially academics) of the educational organisations. It is noteworthy that in the public discourse (via the wide variety of sources used for this article), the people aspect was under-represented. There was a certain uniformity in approaches, with institutions acting in a student-centric manner in recognition of the serious health crisis. Not only students were stressed by the sudden transition to full online delivery during the lockdown, but academics also needed to rush their conversion to the emergency online delivery and assessments. During the three phases of Singapore's reopening thus far, online and blended learning have become more routine, and both students and academics have become increasingly well-versed in it.

Organisational structure largely refers to the nation-wide policies by the Ministry of Education (MOE), and for the PEIs, the Committee of Private Education (CPE). In terms of structure, the educational institutions' policies are dictated by the Singapore government, with the Ministry of Education (MOE) and the Committee of Private Education (CPE) – in the case of PEIs – giving fairly precise directives as regards the control of people on-campus.

Technology includes hardware, learning systems, teaching software, web resources, and other technologies. In our context, it largely refers to EdTech and more generic platforms utilised as a result of the pandemic. Examples include: Zoom, Canvas, MOOCs (in cooperation with providers such as Coursera), WebEx, eLEARN, Microsoft Teams, Respondus, Blackboard, eDimension, Learning Analytics, PebblePad as well as various customised Learning Management Systems (LMS). These learning platforms and video conferencing tools enabled the continuation of learning for the students in Singapore without major interruptions.

Tasks include design, instruction, assessment, and evaluation. As the lockdown between 7 April and 1 June was announced with short notice, learning activities oftentimes had to be converted to an online format at great speed, leading to a phenomenon that has been aptly described as "emergency remote teaching". Live or pre-recorded lectures had to be delivered via the digital platforms described under the technology aspect of the socio-technical model. In terms of assessment, the standard invigilated exams were converted into other types of assessment, ranging from online examinations to continual assessments, including quizzes, projects, and assignments. Several institutions, including some of the most reputable ones, decided to exercise a Satisfactory/Unsatisfactory (S/U) option in lieu of the standard grades.

This work takes a critical review against the literature, but also highlights opportunities for local and international learnings. The study highlighted that while a technology focus was prominent and remained at the fore, such a perspective conflicts with effective pedagogy and andragogy. That is, the methods to educate and facilitate individual learning serves as the first point of analysis, and the technology second. For us, we saw this as a common perspective for the emergency remote teaching practices, but needed to be beyond such as the universities became more sophisticated. However, in identifying a direct entrance to technology, there was likely a lack of consideration to the educator, the learner, and those staff supporting learning. This could have long-term human and sociocultural implications, and some of these are already being seen (e.g., Watermeyer et al., 2021b). These are important, as the nation collectively learns from the COVID-19 experience, and Singapore beginning this journey earlier than many may set useful foundations for andragogical innovation.

Conclusion

The pandemic has brought rapid changes to the way individuals attain knowledge. In the efforts to prevent disruption of the learning process, some of the leading institutes of higher learning in Singapore such as National University of Singapore or Singapore Management University embraced technology well ahead of the curve by integrating online learning in their curriculum (Hutton, 2020). Educational institutes were forced to adapt to full online learning solutions using platforms such as Zoom and Blackboard to facilitate the learning process. Apart from having to adapt to these solutions rapidly, ensuring privacy and security was also a challenge. Early into online learning solutions, there were hacking incidents reported by the Ministry of Education (MOE) where a video-conferencing platform was hijacked by pornographers. While this incident was swiftly resolved, it raised an alert on security and privacy issues (Hutton, 2020).

Despite such disruptions during the sudden move from traditional classes to online learning, it has been argued that the pandemic would also accelerate the integration of information technology in education and eventually become an integral component of education (World Economic Forum, 2020). While COVID created great challenges, it led to long-term opportunities to change higher education. With in-person examinations and tests replaced with alternative assessments or moved to online examinations, the large examination halls may be a thing of the past. The rapid digitisation of lectures may eliminate the need for large, long, and passive lectures. Moreover, the Singapore government's successful technocratic approach towards COVID-19 may lead to a post-pandemic boom in tertiary students from other Asian countries (Leow, 2020b).

The question posed in the title of our article, where a choice was provided between emergency remote teaching and andragogical innovation, should not necessarily be viewed as a binary option. When the whole of Singapore was speedily proceeding to a lockdown, emergency remote teaching was the norm for all but the best-prepared institutions. In the meantime, many potential andragogical innovations have surfaced, the discussion of which would go well beyond the confines of this article. There are many opportunities for research. Our study is based on qualitative content research, and qualitative, quantitative or mixed-methods research is needed to further illuminate the Singapore scenario, also in international contexts. However, this is only the beginning of a new journey. The analysis in this paper identified some institutions having simply digitised their content - taking face to face practices and replicating them in an online

environment. The next stage will be to incorporate online pedagogical principles to shift from technology being the driver of curriculum design and delivery, to technology being the tool or facilitator of a quality curriculum. This change in practice needs to be driven by whole-of-system policy reform, potentially including a national higher education quality framework, institutional policies for online delivery, digital capability building for academics and students, and reimagining the role of the academic, educational designer and educational technologist in the post-pandemic era.

Acknowledgments

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