Disaster Risk Reduction
Methods, Approaches and Practices

Takako Izumi
Indrajit Pal
Rajib Shaw *Editors*

Safety and Resilience of Higher Educational Institutions

Considerations for a Post-COVID-19 Pandemic Analysis

Springer

Disaster Risk Reduction

Methods, Approaches and Practices

Series Editor

Rajib Shaw, Keio University, Shonan Fujisawa Campus, Fujisawa, Japan

Disaster risk reduction is a process that leads to the safety of communities and nations. After the 2005 World Conference on Disaster Reduction, held in Kobe, Japan, the Hyogo Framework for Action (HFA) was adopted as a framework for risk reduction. The academic research and higher education in disaster risk reduction has made, and continues to make, a gradual shift from pure basic research to applied, implementation-oriented research. More emphasis is being given to multi-stakeholder collaboration and multi-disciplinary research. Emerging university networks in Asia, Europe, Africa, and the Americas have urged process-oriented research in the disaster risk reduction field. With this in mind, this new series will promote the output of action research on disaster risk reduction, which will be useful for a wide range of stakeholders including academicians, professionals, practitioners, and students and researchers in related fields. The series will focus on emerging needs in the risk reduction field, starting from climate change adaptation, urban ecosystem, coastal risk reduction, education for sustainable development, community-based practices, risk communication, and human security, among other areas. Through academic review, this series will encourage young researchers and practitioners to analyze field practices and link them to theory and policies with logic, data, and evidence. In this way, the series will emphasize evidence-based risk reduction methods, approaches, and practices.

More information about this series at https://link.springer.com/bookseries/11575

Takako Izumi · Indrajit Pal · Rajib Shaw
Editors

Safety and Resilience of Higher Educational Institutions

Considerations for a Post-COVID-19 Pandemic Analysis

Springer

Editors
Takako Izumi
International Research Institute of Disaster Science
Tohoku University
Sendai, Japan

Indrajit Pal
Disaster Preparedness, Mitigation, and Management
Asian Institute of Technology
Khlong Luang, Thailand

Rajib Shaw
Graduate School of Media and Governance
Keio University
Fujisawa, Japan

ISSN 2196-4106 ISSN 2196-4114 (electronic)
Disaster Risk Reduction
ISBN 978-981-19-1192-7 ISBN 978-981-19-1193-4 (eBook)
https://doi.org/10.1007/978-981-19-1193-4

Preface

The world has spent a majority of 2020 and 2021 enduring an unpreceded crisis caused by the COVID-19 pandemic. The impact of this crisis has been enormous, and the situation has yet to be resolved. It is still difficult to anticipate when the pandemic will be resolved and how our lives will change after the crisis.

Higher Educational Institutions (HEIs) have also had to undergo tremendous transformation, in particular, changing a conventional educational, teaching, and learning system to a digital and online mode and canceling or postponing important events such as graduation and entrance ceremonies and entrance examinations. In addition, a number of HEIs have been facing financial constraints due to reduced enrollment, particularly from overseas. Students have missed out on opportunities to meet their family and friends, causing them profound psychosocial impact and stress.

However, simultaneously, the situation has given HEIs a good opportunity to consider their disaster preparedness, response, and recovery capacity on campus. Some surveys have highlighted a lack of preparedness for pandemic and other hazardous risks beyond natural hazards. Holding a number of students, faculty, and staff, safety issues are a top priority at HEIs.

Based on the above context, this book has three key parts: Part I: Governance (consists of two chapters), Part II: New Teaching and Learning Methodologies (consists of six chapters), and Part III: Innovative Response and Preparedness Based on Science and Technology (consists of six chapters). Covering the experiences and lessons learned from HEIs in preparedness, response, and recovery during the COVID-19 pandemic to prepare for future such calamities beyond natural disasters, this book has two specific target groups. The primary target groups are students, researchers, and academia in the field of disaster risk reduction, higher education, and safety studies. The other target group is practitioners and policymakers for applying the collective knowledge into policy and decision-making. The book will help to better understand the challenges and opportunities related to safety and resilience

of HEIs in the global pandemic phase. We are grateful if the readers find this book useful and relevant.

Sendai, Japan — Takako Izumi
Khlong Luang, Thailand — Indrajit Pal
Fujisawa, Japan — Rajib Shaw

Contents

Part I
Governance

Chapter 1
Overview and Introduction to the Role of Higher Educational Institutions in Disaster Risk Management

Takako Izumi, Indrajit Pal, and Rajib Shaw

Abstract Higher educational institutions (HEIs) have had to undergo significant transformations during the COVID-19 pandemic. Some countries have also experienced both the pandemic and natural hazards, which meant that they have had to move their conventional educational systems to digital and online modes and to cancel or postpone important events. However, the situation has given HEIs a good opportunity to review their campus disaster preparedness, response, and recovery capacities. As the Sendai Framework for Disaster Risk Reduction expects HEIs to play certain disaster risk management roles to support its implementation and contribute to future risk reduction, HEI networks were developed and have been actively focused on their new responsibilities. This chapter provides an overview of the HEIs' disaster management roles and network activities as well as a short discussion on the book's key concepts and components.

Keywords COVID-19 · Higher educational institutions · Sendai framework for disaster risk reduction · Disaster risk management · Hyogo framework for action

1.1 Introduction

The world has spent the majority of 2020 and 2021 enduring the unpreceded crisis resulting from the COVID-19 pandemic. This crisis has had an enormous impact on all aspects of life in most countries, and as the situation is yet to be fully resolved, it is still difficult to anticipate when the pandemic will be over and

T. Izumi (✉)
International Research Institute of Disaster Science, Tohoku University, Sendai, Japan
e-mail: izumi@irides.tohoku.ac.jp

I. Pal
Disaster Preparedness, Mitigation, and Management, Asian Institute of Technology, Khlong Luang, Thailand

R. Shaw
Graduate School of Media and Governance, Keio University, Fujisawa, Japan
e-mail: shaw@sfc.keio.ac.jp

T. Izumi et al. (eds.), *Safety and Resilience of Higher Educational Institutions*,
Disaster Risk Reduction,
https://doi.org/10.1007/978-981-19-1193-4_1

how our lives will change. While the COVID-19 pandemic has raged worldwide, there have been numerous other natural hazard occurrences, many of which were hydro-meteorological (UNESCAP 2021).

The highest risks over the next 10 years are expected to be associated with extreme weather events, climate action failures, human-led environmental crises, digital power concentration, digital inequalities, and cybersecurity failures. However, one of the highest identified risks in the next decade is expected to be infectious diseases (WEF 2021). Therefore, as the simultaneous occurrences of both natural hazards and infectious diseases are expected to continue in the future, the impacts could be even greater than currently being experienced.

Higher educational institutions (HEIs) have also had to undergo tremendous transformations during the pandemic, with some countries experiencing both the pandemic and natural hazards. Most HEIs have had to rapidly change their conventional educational, teaching, and learning systems and move to digital and online modes as well as to cancel or postpone important events, such as graduations, entrance ceremonies, and entrance exams (Zhu and Liu 2020; Ali 2020; Mishra et al. 2020; Toquero 2020). Some HEIs have also been facing financial constraints due to reduced enrolments, particularly of overseas students (Friedman et al. 2020). Students have also had few opportunities to meet their families and friends, which has had profound psychosocial and stress impacts. The COVID-19 pandemic has been found to adversely affect the emotional well-being and mental health of the people worldwide (Aristovnik et al. 2020; Tang et al. 2020; Sandarasen et al. 2020).

However, this situation has given the HEIs the opportunity to review their campus disaster preparedness, response, and recovery capacities (Izumi et al. 2020), with the safety of the students, faculty, and staff being the top priority. This chapter provides an overview of the HEIs' disaster management roles and outlines this book's key concepts and components.

1.2 Scientific Community Disaster Risk Reduction Expectations

The major disaster risk reduction blueprint for national disaster risk reduction (DRR) strategies has been the Hyogo Framework for Action (HFA) and the Sendai Framework for DRR. Disaster risk management involves various stakeholders, each of whom plays a critical role in their different areas. The HFA, which was adopted in 2005 at the United Nations World Conference on Disaster Reduction, highlighted that collaboration and cooperation between stakeholders, such as national states, regional organizations and institutions, international organizations, the civil society, the scientific community, the media, and the private sector, were crucial to effective DRR (United Nations 2005).

The Sendai Framework for DRR, which was adopted in 2015 at the UN World Conference on DRR, also highlighted the shared DRR responsibilities of governments and relevant stakeholders (United Nations 2015) as well as promoted the enhanced incorporation of all-hazard, evidenced-based approaches with multisectoral and multidisciplinary dimensions. In particular, the framework recommended that academia, scientific, and research entities, and networks "focus on the disaster risk factors and scenarios; increase research for regional, national, and local applications; support action by local communities and authorities; and support the interface between policy and science for decision-making" (United Nations 2015). Therefore, the scientific community is expected to support the DRR actions by local communities and authorities through relevant research and actual implementation.

Compared with the earlier HFA, these higher academia and research community expectations were more evident in the SFDRR, as evidenced by the frequent academic and science-associated terminologies (Table 1.1). While "science" and "academia" were not even mentioned in the HFA, in the SFDRR, the terms science and scientific were repeatedly used. The SFDRR also put greater focus on technology. Over the 10 years from 2005 to 2015, the critical approaches to DRR moved toward more evidence and science-based approaches, implying that the scientific DRR community roles and expectations have become a major focus and that HEIs need to better link their research findings and evidence to local practices.

In addition to the HEIs' DRR roles and responsibilities, at the first Asian Science and Technology DRR Conference in August 2016 in Thailand, the Sendai Framework also established 12 priority actions for the "Science and Technology Roadmap." In the recommendations, academia/universities were requested to develop their own DDR management plans and develop interdisciplinary national science and technology plans to support the implementation of the Sendai Framework (Shaw et al. 2018). Therefore, besides needing to contribute to the strengthening of DRR capacity in their societies and countries, HEIs are now also expected to enhance their own risk management and emergency capacities to protect the lives of their students, faculty, and staff (Jaradat et al. 2015; APRU).

Table 1.1 Comparison of science-based references in the HFA and SFDRR

	HFA	SFDRR
Science	0	12
Scientific	11	18
Technology	5	30
Academia	0	5
Research	8	20
Innovation	4	12

1.3 Role of HEIs in Disaster Risk Management

Ahmad (2007) claimed that the DRR management role of universities was to provide disaster education, provide relief and support to affected communities, support policy proposals, continually dispatch long-term volunteers and other aid, and provide a research perspective. Abedin and Shaw (2015) concluded that universities played a major role in both DRR planning and implementation as all efforts require a scientific basis to ensure the provision of proper information to deal with the associated disaster uncertainties. These impacts needed to be fully understood before any preparedness plans could be translated into policy and regulatory measures. By sharing a case from Thammasat University based on the 2011 Thai floods, Hirunsalee et al. (2013) recommended that universities perform additional DRR roles beyond their fundamental role of providing higher education, such as providing evacuation centers. Izumi (2018) also concluded that HEIs needed to invest and allocate funds for disaster preparedness. Therefore, it is important for universities to have DRR emergency measures in place, such as retrofitting old campus buildings, constructing new anti-seismic buildings, and investing in proper equipment and facilities, such as satellite phones, generators, emergency communication systems, and emergency stockpiles. In particular, HEIs are expected to develop emergency DRR management or preparedness plans and a business continuity plan to guide their response and recovery activities.

In 2020, nearly 1.6 billion students worldwide were affected by school closures and, due to the lack of preparedness of education systems, schools and teachers were forced to adapt to new teaching and learning methods almost overnight. Therefore, online teaching has now become common for many students; however, the move to this education mode has presented significant challenges as not all learners have access to the Internet or computers, which has increased the social inequalities in many nations (UNESCO 2021). Not only have HEIs had to shift to remote learning but have also faced significant financial challenges (Friedman et al. 2020). Nonetheless, regardless of the difficulties, HEIs have developed innovative ways to support their students and neighboring communities during the pandemic. For example, the University of the Philippines opened its first 26-bed capacity community isolation facility for suspected COVID-19 patients with mild symptoms and those awaiting swab test results and unable to quarantine at home. Furthermore, Chulalongkorn University's engineering faculty and students developed several technology projects to reduce the risk and impact of COVID-19, such as quarantine delivery long-range control robots that can assist medical staff care for COVID-19 patients through telecommunication and deliver food (Izumi et al. 2021).

However, an HEI survey found that around 40% claimed that their HEIs lacked a general emergency preparedness plan, and of the 60% that had a plan, 33% did not cover biological hazards (Izumi et al. 2020). The challenges HEIs have faced when developing their preparedness measures include financial constraints, human resource challenges, difficulties in fully understanding the possible risks and safety issues, and a lack of participation by faculty and staff (Izumi 2015). COVID-19 has presented a window of opportunity for HEIs to understand the importance of effective

comprehensive preparedness plans that respond to both biological and natural hazards and the need to invest in the necessary equipment and facilities to continue their education and research during and after emergencies.

1.4 Academic Initiatives and Collaboration

To scale up the HEIs' contributions to disaster risk management, university networks need to play significant and proactive roles by analyzing data through joint research, mobilizing academic sharing experiences, facilitating global and regional expert discussions, increasing their young researcher and academic research capacities, and linking research, policies, and practices. Several HEI networks have been established to activate these roles, such as the Asia–Pacific Science Technology and Academia Advisory Group (APSTAAG), the Integrated Research on Disaster Risk (IRDR), and the Association of Pacific Rim Universities (APRU).

(1) The Asia–Pacific Science Technology and Academia Advisory Group (APSTAAG)

To highlight the important role of science and technology in DRR, the United Nations Office for Disaster Risk Reduction (UNDRR) established the Asia Science, Technology, and Academia Advisory Group (ASTAAG) in 2015, after which it was expanded to cover the whole Pacific region to become the Asia–Pacific STAAG. The aims of the group are to contextualize global efforts to address the unique needs of the region and support the implementation of the Sendai Framework for DRR. APSTAAG comprises selected disaster experts from several Asian countries, such as Bangladesh, China, India, Indonesia, Japan, Malaysia, and the Philippines. The group provides policy advisory services to Asian governments and other stakeholders on appropriate technology and its application to DRR decision-making (Shaw et al. 2018).

APSTAAG has issued several reports, such as the "Asia Science Technology Status for Disaster Risk Reduction" in 2016, "Science & Technology into Action: DRR Perspectives from Asia" in 2018, the "Status of Science and Technology in DRR in the Asia–Pacific" in 2020, and the "Asia–Pacific Regional Framework for NATECH (Natural Hazards Triggering Technological Disasters) Risk Management" in 2020. It also takes the lead in organizing the Asia–Pacific Science and Technology Conference in DRR, which is held every 2 years in conjunction with the UNDRR Regional Office for Asia and the Pacific.

(2) The Integrated Research on Disaster Risk (IRDR)

The IRDR is an interdisciplinary research program focused on addressing the challenges brought by natural hazard events, mitigating their impacts, and improving the related policy-making mechanisms. The program coordinates the natural, socioeconomic, health, and engineering sciences to reduce the risks associated with

natural hazards and, in particular, addresses the technological and health-related consequences of natural hazards.

IRDR is governed by a 14-member Scientific Committee, which is responsible for defining, developing, and prioritizing the IRDR plans. The Committee aims to include a balanced regional and gender representation of relevant disciplines in the natural, social, and engineering sciences. IRDR also has National Committees in China, Colombia, France, Germany, Indonesia, Iran, Japan, Korea, Nepal, New Zealand, and the United States that support and supplement IRDR's research initiatives and help establish or further develop crucial links between national DRR programs and activities and the international framework.

Another significant IRDR program is the Young Scientist Program. SFDRR seeks to enhance the role of science and technology in evidence-based decision-making by promoting the capacity building of young professionals and encouraging them to undertake critical innovative and needs-based research. The Young Scientist Program selects an "IRDR Young Scientist" for a maximum of 3 years, whose responsibilities include contributing to innovative DRR research, acting as IRDR ambassador at different conferees and/or on social media, and developing and contributing to the networking of young professionals.

(3) Association of Pacific Rim Universities Multi-hazards (APRU MH) Program

APRU is a university network comprising 60 universities from 19 Pacific Rim economies. The APRU MH program was established in April 2013 in collaboration with Tohoku University in Japan to harness the collective capabilities of the APRU member universities to conduct cutting-edge DRR research and contribute to discussions on DRR policies and decision-making at major international conferences and events, such as the World Bosai Forum, the Global Platform for DRR, and the Asian Ministerial Conference on DRR. The program's major activities include organizing a 4-day summer school for students and young researchers from all over the world, running an annual symposium, and managing an international journal called *Progress in Disaster Science*. However, in 2020–2021, these events were replaced by online webinars. Even though it has moved to an online educational platform, the program has continued its educational activities and has been providing online lectures by various experts from different sectors, such as international and regional organizations, the private sector, NGOs, and academia. The webinar topics cover various critical issues, such as COVID-19, hazard risk management, the resilient society, and the lessons learned from the 2011 Great East Japan Earthquake and Tsunami.

APRU MH also publishes several publications, such as *Universities' Preparedness and Response toward Multi-hazards: COVID-19, Natural, and Human-Induced Hazards*, which collects COVID-19 and other hazard preparedness case studies focused on the response and recovery activities by universities. It also developed "30 innovations for DRR" and "30 innovations linking DRR with SDGs," which highlighted innovative DRR approaches and products and the DRR efforts that could contribute to achieving the SDGs. This network provides students and researchers with various opportunities for collaboration, learning, and exchanging knowledge and views that could assist their future studies and research.

1.5 Book Structure

This book has 15 chapters under three parts, namely, (1) Governance, (2) New teaching and learning methodologies, and (3) Innovative response and preparedness based on science and technology, which include the HEI preparedness, response, and recovery experiences and lessons learned during the COVID-19 pandemic to prepare for similar future calamities beyond natural hazards. This chapter and Chapters 2 and 3 focus on governance. Chapter 2 analyzes two case studies from Thailand and the United States, which give a comprehensive review of the key challenges and possible ways forward for HEI post-pandemic management. Chapter 3 reviews existing HEI preparedness capacities, identifies the problems and challenges in their plans based on a survey conducted using a minimum checklist, and recommends how current preparedness measures could be improved to better prepare for future hazards, including pandemics.

Chapters 4–9 focus on new teaching and learning methodologies and include case studies from the Asia–Pacific region, Africa, the South and North Americas, South Asia, and East Asia. Chapter 4 focuses on the online and hybrid teaching and learning methods developed by various educational institutions. Chapter 5 provides critical insights into how the sector has been affected in the African continent and how it has responded to the situation. Chapter 6 reviews disaster risk governance in Guatemala and outlines the leading role a university can take in developing a new disaster risk management law. Chapter 7 outlines the best practices and novel solutions to both student learning and faculty teaching through a series of 15 case studies and analyzes examples of how universities in North America have effectively responded to the challenges. Chapter 8 focuses on the existing challenges at the university level in Bangladesh and the possible approaches needed to cope with the post-pandemic situation. It also provides a guide for future crisis management and resilience building based on the COVID-19 pandemic experience. Chapter 9 reviews the Taiwan government's HEI epidemic prevention and examines the universities' roles in developing new and innovative remote teaching services and an automated temperature-measuring device with a contact tracing system to help quickly grasp the infection chain.

Chapters 10–15 focus on innovative science and technology responses and preparedness measures in the Pacific, South Asia, and East Asia and give examples of the partnerships developed with academia, NGOs, and the private sector. Chapter 10 outlines the 2020 adjustments made in New Zealand's university enterprises in response to the COVID-19 pandemic, examines the sector's robust technological adjustments, and explores the vulnerabilities arising from the border restrictions on international student mobility and the consequences for university income. Chapter 11 introduces the educational anti-epidemic policies and laws in Taiwan and highlights the pathways for the receipt and transmission of transparent and real-time COVID-19 pandemic information and regulations. Chapter 12 describes the HEI responses employed in Hong Kong during the first 14 months of the pandemic when the city experienced four waves and then examines the groundwork laid by

the development of a Health Emergency and Disaster Risk Management Massive Open Online Course. Chapter 13 highlights the multi-stakeholder efforts to learn the lessons from the July 2020 flood in Japan. Chapter 14 outlines the COVID-19 preparedness and response experiences by the National Resilience Council (NRC) in the Philippines and its university network and provides insights into the evidence-informed risk governance implementation of the NRC's Resilient Local Government Systems program for all hazards, which was developed in cooperation with academic partners.

Finally, Chapter 15 analyzes the impacts by COVID-19 on HEIs with six different issues, and proposes four specific recommendations, namely inclusive BCP/ECP, flexibility in HEIs, developing a social support mechanism, and spreading messages of positivity.

References

Abedin MA, Shaw R (2015) The role of university networks in disaster risk reduction: perspective from coastal Bangladesh. Int J Disaster Risk Reduct 13:381–389

Ahmad R (2007) Roles of the university in disaster management. Malaysian J Med Sci 14(2):1–3

Ali W (2020) Online and remote learning in higher education institutes: a necessity in light of COVID-19 pandemic. Higher Educ Stud 10(3)

Aristovnik A, Kerzic D, Ravselj D, Tomazevic N, Umek L (2020) Impacts of the COVID-19 pandemic on life of higher education students: a global perspective. Sustainability 12:8438

Friedman S, Hurley T, Fishman T (2020) COVID-19's impact on higher education: strategies for tackling the financial challenges facing colleges and universities. Deloitte Center for Higher Education Excellence

Hirunsalee S, Denpaiboon C, Kanegae H (2013) Public attitudes toward the additional roles of university in disaster management: case study of Thammasat University in 2011 Thailand floods. Procedia Environ Sci 17:899–908

Izumi T (2015) APRU-IRIDeS multi-hazards program: campus safety report 2015

Izumi T (2018) Investing in disaster risk reduction: implications for science and technology based on case studies from the local and national governments, the private sector and a university network. In: Shaw R, Shiwaku K, Izumi T (eds) Science and technology in disaster risk reduction in Asia: potentials and challenges. Academic Press, pp 221–237

Izumi T, Shaw R, Zhang H (2021) Universities' preparedness and response towards multi-hazards: COVID-19, natural and human-induced hazards by IRIDeS of Tohoku University, Keio University, Tsinghua University, Japan. 79 pages

Izumi T, Sukhwani V, Surjan A, Shaw R (2020) Managing and responding to pandemics in higher educational institutions: an initial learning from COVID-19. Int J Disaster Resilience in the Built Environ 12(1):51–66

Jaradat A, Mziu H, Ibrahim J (2015) Disaster preparedness in universities. Int J Comp Trends Technol 19(1)

Mishra L, Gupta T, Shree A (2020) Online teaching-learning in higher education during lockdown period of COVID-19 pandemic. Int J Educ Res Open 1:100012

Sandarasen S, Chinna K, Kamaludin K, Nurunnabi M, Baloch GM, Khoshaim HB, Hossain SFA, Sukayt A (2020) Psychological impact of COVID-19 and lockdown among University Students in Malaysia: implications and policy recommendations. Int J Environ Res Public Health 17:6206

Shaw R, Izumi T, Shiwaku K (2018) Science and technology in disaster risk reduction in Asia: Post-Sendai developments. In: Shaw R, Shiwaku K, Izumi T (eds) Science and technology in disaster risk reduction in Asia: potentials and challenges. Academic Press, pp 3–16

Shaw R, Yang S, Chan E, Shi P (2018) Science and technology into action: disaster risk reduction perspectives from Asia. Asia Science Technology Academia Advisory Group (ASTAAG) Secretariat, Beijing, China

Tang W, Hu T, Hu B, Jin C, Wang G, Xie C, Chen S, Xu J (2020) Prevalence and correlates of PTSD and depressive symptoms one month after the outbreak of the COVID-19 epidemic in a sample of home-quarantined Chinese university students. J Affect Disord 274:1–7

Toquero CM (2020) Challenges and opportunities for higher education amid the COVID-19 pandemic: the Philippine context. *Pedagogical Research* 5 (4):em0063

UNESCAP (2021) Resilience in a riskier world: managing systemic risks from biological and other natural hazards: Asia-Pacific disaster report 2021

UNESCO (2021) The impact of the COVID-19 pandemic on student voice: findings and recommendations

United Nations (2005) Hyogo framework for action 2005–2015: building the resilience of nations and communities to disasters

United Nations (2015) Sendai framework for disaster risk reduction 2015–2030

World Economic Forum (2021) The global risks report 2021—16th edition: Insight report

Zhu X, Liu J (2020) Education in and after Covid-19: immediate responses and long-term visions. Postdigital Sci Educ 2:695–6599

Chapter 2
Post-Pandemic Management in Higher Educational Institutions

Indrajit Pal, Ganesh Dhungana, and Anushree Pal

Abstract COVID-19 pandemic and its global impacts pushed higher education institutions into various levels of difficulties. They are struggling to change their organizational and management strategies to make it functional. In this muddled situation, adapting to the new normal for education continuity is becoming a prime challenge. The rapid adaptation of digital education governance is not able to provide a holistic solution for administration. The shift in the paradigm is expected to be more fragile in post-pandemic management, as they require multistage inter- and intra-organizational coordination for seamless functioning. Most importantly, the possible risk associated with the reopening for in-person instructions cannot be neglected. Henceforth, education governance in post-pandemic demands risks analysis and mitigation support to ensure safety for all in a regular motion of governance. This chapter analyzes two secondary cases and evaluates the higher education institutions' management context during and post-pandemic institutional governance and its efficacy and adaptation for education continuity.

Keywords Education institution · Pandemic · COVID-19 · Governance · Risk

2.1 Introduction

The outbreak and continuous spread of the COVID-19 pandemic since December 2019 have seriously and broadly affected the education sector around the world. The United Nations (2020) estimated that nearly 1.6 billion learners in more than 190 countries and all continents were affected by this global public health crisis. At the end of April 2020, educational institutions were forced to shut down in 186 countries, affecting 74% of enrolled students (Di Pietro et al. 2020). To ensure education continuity, many higher educational institutions made an emergency transform, or an unplanned and sudden shift, from traditional to distance learning, which is the

I. Pal (✉) · G. Dhungana · A. Pal
Disaster Preparedness, Mitigation, and Management, Asian Institute of Technology, Khlong Luang, Thailand
e-mail: indrajit-pal@ait.ac.th

T. Izumi et al. (eds.), *Safety and Resilience of Higher Educational Institutions*, Disaster Risk Reduction,
https://doi.org/10.1007/978-981-19-1193-4_2

so-called Emergency Remote Learning (Khlaif et al. 2021). The pandemic also posed immense stress on the administration of education institutions as all administrative tasks were forced to conduct remotely. The lack of technologies, devices, software, infrastructures, and many other basic requirements for remote management created a huddle. Though in some countries, governments provided short-term support grants for the supply of digital learning devices to help education institutions to maintain their operations and activities (OECD 2020), the provided support was not enough for a complete transformation to address the need for remote management.

In general, education governance has been adversely challenged by the COVID-19 crises. Education governance refers to how decision-making happens in education systems (OECD 2019). Dobbins et al. (2011) present an analytical framework and provide indices to measure the diverse and similar practices of higher education governance at the cross-country level by examining the most practiced models of education governance: academic self-governance, the state-centered model, and the market-oriented model. Education governance can be observed through its management function, including organogram, governing policies, and deliveries when focusing on higher education institutions. Subsequently, the Education Policy Outlook Analytical Framework has simplified the understanding of education governance by segregating it into three main components: formal structures for allocation of roles and responsibilities, setting objectives and policy priorities, and stakeholder engagement (see Fig. 2.1).

During the COVID-19 pandemic, the unplanned and sudden shift in education governance has changed dynamics and placement of key components such as role and engagement of information communication technologies. This changing paradigm is demanding to relook into previously practiced models of education governance to make it more adaptive and resilient for the post-pandemic context. The literature (both academic and gray) reviewed here clearly shows that educational institutions'

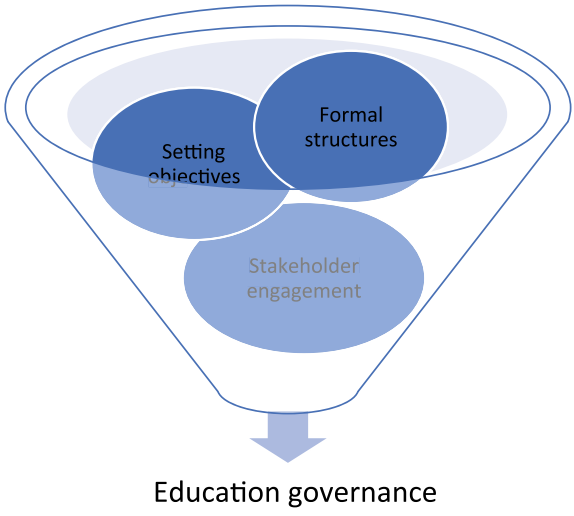


Fig. 2.1 Education governance as defined in the education policy outlook analytical (*Note* The structural idea was developed by the Organization for Economic Cooperation and Development to define education governance. From "*Working Together to Help Students Achieve their Potential*" by OECD 2019, Education Policy Outlook)

governance will be a complex challenge in the post-pandemic era. So, the system cannot be just swift back to existing approaches and models. The connection of digital technology must be satisfactorily addressed and incorporated into the mechanism. It should make necessary changes as higher education institutions cannot ignore the concept of digital education governance (Williamson 2015a, b) in the post-pandemic era.

The concept of digital education governance was emerging with the increasing penetration of the internet, digital technologies, and devices. Many higher education institutions had partially practiced, but it boomed after the COVID-19 pandemic. Murphy and Farley (2017) also support that with the growing influence of digital devices, many academic institutions had started to promote virtual learning in the last few years but were not completely ready to shift into digital education. Digital education governance requires digital systems to manage the flow in the administration and control of educational systems, institutions, and individuals (Williamson 2015a, b). Therefore, the forced shift is not a complete solution. It needs a detailed study to pinpoint significant gaps for its immediate plaster to protect the leakage for resilience education governance.

The impacts on higher education institutions created by the pandemic have been broadly studied and presented in numerous publications since the COVID-19 outbreak. Some studies focus on the impacts at an individual level, analyzing how the pandemic has affected students' and instructors' mentality or ability to adapt to the changing conditions under certain constraints or contexts (such as Al-Amin et al. 2021; Souza et al. 2020; Xhelili et al. 2021). Some other studies examined higher educational institutions' preparedness and/or adaptation strategies or systems amidst the pandemic at the institutional or country level (such as Agasisti and Soncin 2021; Béché 2020; Edelhauser and Lupu-Dima 2020). These reviewed literature have shown that the sudden shift in the entire education system forced the rapid adoption of digital education governance (Williamson 2015a, b), with no other static alternatives. However, this new adaptation has opened the discourse emphasizing the need for remote management of academic institutions and may lead to many new models for effective education governance. As Edwards (2014) shows that the digital education governance was in a process and envisioned to support and assist the pre-existed models but couldn't be processed through the expected pathways as the COVID-19 reshuffled the process and forced it for the sudden shift. Marks et al. (2021) reflect that many educational institutions possess challenges in governance while adapting to digital transformation as they were not prepared enough for the shift. Henceforth, it reflects that the digital education governance was emerging but wasn't prepared to take over the entire governance system of higher education institutions (Williamson 2015a). In this context, within a year and a half, it would be too early to evaluate the impact and opportunities brought by the rapid adaptation of this new approach of education governance. However, the study is concerned with the adaptability of this forced adaptation directly from the incubation, which is still demanding more ample supplies for the adaptability.

This study has noticed that there and subsequent gaps in different practiced models of education governance. Most of the earlier literature regarding pandemic impacts on

higher education institutions was limited to emergency situations. Since the COVID-19 pandemic has been around for more than a year, some temporary measures have gradually become the "New Normal." While the spread of COVID-19 has been slowed down in some areas of the world, the risk of any new outbreak remains a threat to education continuity. Analyzing this changing context, the study has set its purpose to examine how education governance in higher education institutions has been transformed through the pandemic into the "New Normal," in order to shed light on the future of education governance in higher education institutions to make them more resilient to hazard events and more adaptable to changing environments.

2.2 Conceptual Framework for Adaptability

Before the onset of the COVID-19 pandemic, disparities in education existed across countries, regions, income groups, genders, etc. The educational rupture caused by COVID-19 has exacerbated these pre-existing issues, posing unprecedented pressure on higher education institutions in their governance. To prepare education institutions for any similar hazard event in future, it is necessary to build education systems and institutions' adaptive capacity or adaptability. Green et al. (2020) define adaptability as the ability of education systems to respond to rapidly changing circumstances while maintaining stability, promoting equality, and expanding substantive freedoms and well-being. For that, the authors developed a framework for adaptability, which is composed of 3 elements: cooperation, inclusion, and flexibility and is divided into 4 interconnected levels: individual, community, state, and global (see Fig. 2.2). Throughout these levels, multiple types of risk presented in education, such as social exclusion, financial challenges, and external shocks, are collectivized as a core component of systematic support.

Based on this framework, higher education institutions can be placed at the center of a community, facilitating community connectivity, and further improving collective adaptability and resilience. Higher education institutions can strengthen cooperation by adopting a participatory approach that encourages mutual support and plurality in their decision-making. They can enhance inclusion by offering a place where individuals with and between different communities, upon ensuring non-discrimination, come together to have positive social interactions. Finally, flexibility can manifest itself in the adaptive management of education governance enabled by strong cooperation and inclusion.

The OECD education governance framework presented in the previous section and the Framework for Adaptability above altogether offer a conceptual foundation for the discussion of the management in higher education institutions about education governance and investigate the influencing factors such as digital technologies, virtual platforms, capacity (human and financial) as framed by the digital educational governance (Williamson 2015a, b).

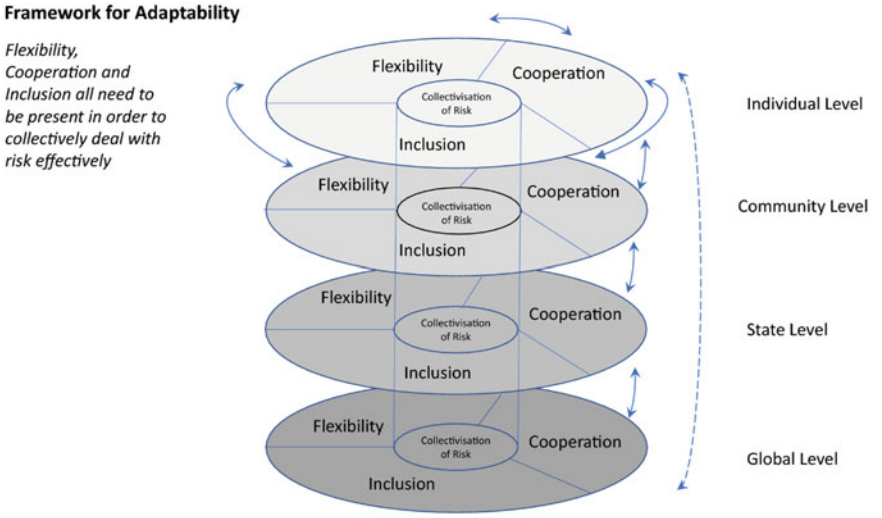


Fig. 2.2 Framework for adaptability (*Note* The figure provides a conceptual outlook of the adaptability framework. From "Preparing education for the crises of tomorrow: A framework for adaptability" by Green, C., Mynhier, L., Banfill, J., et al., International Review of Education 66, 857–879, 2020)

2.3 Establishment of a New Normal: How to Prepare for Institution Reopening and Education Governance in the Post-pandemic Times?

As mentioned earlier, a majority of the higher education institutions were forced to physically close during the pandemic. Senior leaders were tasked with making rapid-fire decisions while keeping the health and safety of students, faculty, and staff foremost in their planning. Due to the lack of conceptual and implacable obscurity added with policy implications, the education system couldn't adjust coherently in response to governance in many places (El Masri and Sabzalieva 2020). They faced challenges such as canceling events, moving students to home, shifting the instruction mode, modifying policies and procedures, etc. Soon after that, leaders were overwhelmed by the second-wave effects such as summer/fall scenario planning, undertaking significant budget reductions, continuing to monitor and adjust policies, furloughs, employee layoffs, and considering longer-term impacts on students and university employees (Kruse et al. 2020).

A similar situation is arising in the early stage of the recovery. More importantly, the preparation of institution reopening as the pandemic situation came gradually under control. During and after the first phase of COVID-19 transmission, several reports (such as Reimers and Schleicher 2020; OECD 2020; Carvalho et al. 2020) proposed strategies to safely reopen institutions. While some of the suggestions might be temporary or transitional measures, many other suggestions are of long-term

influence and may serve the post-pandemic management on education governance. The dreadful experiences have pinpointed the need for a resilience education system (Pal et al. 2021) and demand to redefine the positionality of educational institutions in disaster governance and assurance of adaptation of emergency management plan as an essential component in education governance.

Based on the OECD education governance framework, some proposed measures for institution reopening in the reports cited above can be roughly categorized. Most of these measures are also suitable for long-term implementation in the post-pandemic times.

Some of the mentioned measures (in Table 2.1) were being observed in the presented two case studies: one from Thailand and another from the United States of America. Both cases collected through secondary sources were looked through the above-defined indices to generate a comprehensive outlook of the key challenges and possible ways forward for the management of the higher education institutions in post-pandemic situations.

2.4 Case Study 1: Asian Institute of Technology, Thailand

Asian Institute of Technology (AIT) is an English-speaking postgraduate institution. Sitting on a green campus located just north of Bangkok, AIT operates as a multicultural community where the faculty, staff, and students, mostly from the Asia–Pacific and fewer from other regions, live and learn together.

Thailand had managed to contain the transmission of the virus quite successfully during the onset of the first wave of COVID-19 starting from March 2020, with strong public health and social measures. A full-scale national lockdown, curfews, and 14-day mandatory quarantine for international travelers were soon introduced. In addition, contact tracing was performed by over 1000 surveillance and rapid response teams with support from 1.1 million village health volunteers to identify, isolate, and quarantine cases (Rajatanavin et al. 2021).

2.4.1 First Actions Taken to Strengthen the Formal Structures

AIT took immediate action almost right after the virus spread to Thailand at the end of January 2020 by forming the AIT Coronavirus Task Force. The task force is dedicated to monitoring the crisis and devising policies and strategies following the latest development of viral transmission to ensure public health and safety on campus and education continuity. In addition, following the Thai government's declaration of a national emergency last spring, preparedness plans were implemented, severe measures were imposed on the AIT campus, and donated masks were distributed to the whole AIT community.

Table 2.1 Propose measures for school reopening

Components	Measures/actions	Potential integration of adaptability factors
Formal structures	• Develop a contingency plan to continue remote learning based on the lesson learned from the first wave	• Collectivization of risk
	• Develop protocols to maintain physical distancing and institutional operations and build capacity to implement them	• Collectivization of risk
	• Create an effective education delivery system in which the roles of stakeholders, including instructors, administrative staff, and students, should be reimagined, rethought, and their needs are supported	• Cooperation • Inclusion • Flexibility
	• Build capacity to lead adaptively and support innovation that transcends existing leadership's limitations through multi stakeholder and flexible collaborations	• Cooperation • Inclusion • Flexibility
Setting objectives and policy priorities	• Develop the capacity for blended learning that incorporates face-to-face learning and teaching in institutions, which requires a creative integration of the spaces, time, people, and technologies into an ecosystem of learning	• Cooperation • Flexibility
	• Assess student needs and outcomes both academically and emotionally. Individualized strategies are essential to retaining the engagement of students	• Inclusion
	• Rebalance the integrated curriculum in the modified institution environments where health guidelines and a hybrid learning ecosystem will be established	• Inclusion • Flexibility

(continued)

Table 2.1 (continued)

Components	Measures/actions	Potential integration of adaptability factors
	• Systems of teaching support and collaboration should be developed in a sustainable and integrated way to provide knowledge and skills for instructors to embrace new pedagogies and assume new functions beyond teaching to support students and their families	• Cooperation • Inclusion
	• Target for most needed resources through strategic coordination of actions. Planning activities for institutional reopening and continuous management should factor in underlying risks such as vulnerable groups and lack of contingent support	• Inclusion • Cooperation
Stakeholder engagement	• Strengthen and expand the learning ecosystem with new alliances and partnerships, such as technology solutions and telecom service providers, to ensure remote education is possible and learning environments are ready to respond to any future crisis promptly	• Collectivization of risk • Cooperation
	• Develop an effective communication system among all stakeholders is particularly critical to ensure the coherence of a hybrid learning ecosystem	• Cooperation • Inclusion
	• Engage communities in planning activities that will help establish public trust and manage fear and risk perceptions. Communities affected by the pandemic have a lot to share for effective and localized planning	• Cooperation • Inclusion • Flexibility

2.4.2 Setting Policy Priorities and Keep Stakeholders Engaged

AIT officially closed on March 18, 2020, following the policy announced by the Thai Government. The priority was given to ensure educational continuity. Classes were quickly shifted from face-to-face to interactive online instruction for the rest of that Spring Semester. Final exams and thesis defenses were also conducted online. While AIT has maintained a virtual learning environment via Moodle at all times, a video conferencing app and an online exam platform were also introduced to optimize the online learning and evaluation experience. The May 2020 Graduation Ceremony was canceled, but students were invited to the December 2020 Graduation exercises.

On August 4, 2020, the Fall Semester started in normal operation. While students were allowed to attend classes on campus, health was placed as the foremost priority at AIT. As some overseas students were not able to physically join the community, the hybrid instruction mode was established to ensure no one is left behind. For that, required equipments were set up in the main classrooms to transform them into smart modified classrooms. In the meantime, AIT staff and students were devising creative ways to involve online students in student life. As for the students who managed to come on campus while being required to undergo a 14-day quarantine period, AIT gained approval from the Thai Government to set up an official Organizational Quarantine (OQ) facility with Thammasat University Hospital as the medical partner. This OQ facility had served more than 250 students as of August 2021.

While the second wave and the third wave of the COVID-19 pandemic hit the country relatively in January and April 2021, forcing AIT to physically close and impose strict measures again to keep the campus safe. The previous experience has successfully equipped the community with the adaptive capacity to promptly react and smoothly transition toward the New Normal. The AIT Coronavirus task force remains in operation. Throughout all these times, an intranet column is maintained, and frequent emails are spread within the AIT community to keep the communication channel open and messages being conveyed in a consistent and unambiguous way.

2.4.3 Learning from the Past Experience

On October 21, 2011, AIT suffered its worst-ever crisis. The flood devastated the entire campus, with two meters of water overwhelmed. Though the institution had set up structural measures to mitigate the flood risk, the unexpected force of water and breakages in the dykes resulted in water overflow. After a significant loss, AIT went through the devastating flood; the institution has been extra careful and conscious about the risk of possible hazards and has worked on strengthening policies and structural mechanisms being prepared for effective management of any sort of crisis. The serious initiation and concern in managing the COVID-19 was also motivated and alerted by that tragedy.

2.5 Case Study 2: Challenges in Academic Leadership

Academic leaders have been unprecedentedly challenged by the COVID-19 crisis. As the landscape of higher education institutions rapidly evolved, they were forced to devise and restructure almost the entire education system that has been running for ages. In academic leadership, department heads play a significant role in leading through times of upheaval and crisis. Kruse et al. (2020) interviewed three department heads in public land-grant universities in the U.S. regarding their leadership and management of this crisis.

2.5.1 Unexpected Crisis Not Covered by the Existing Plans

It was found that most higher education institutions had their crisis plans designed for the risk management of campus violence, fires, and hurricanes with little awareness or detail for a global pandemic. The outbreak of COVID-19 in the U.S. coincided with the spring vacation, which left some time for the leaders to prepare. The immediate impact of COVID-19 on the role of department heads focused on the shift of instructional modes from traditional in-personal events to online interactive ones. While the department heads played an instructional support role for faculty who had to adjust to new modalities of teacher, some of them admitted the tensions due to upper administration's ambiguous messages about online courses for Spring and Summer, which became increasingly insistent on returning to the traditional face-to-face format mid-summer. Department heads were left to explain the ambiguity between different messages and alleviate the faculty's fears.

2.5.2 Responsibility of Managing People's Mental State

In the meantime, people still have negative perceptions about the quality of remote learning. Absenteeism is common among students, which frustrated some instructors. While academic freedom may play a role in faculty choices and preferences for teaching modalities, more instructors showed compliance rather than rebellion in choosing class modality. This is considered a contradiction which represents a form of emotional labor. Therefore, department heads were tasked to work with faculty to reconcile the recommendations from higher-level management with their instructional preferences. They also felt the responsibility of managing everyone's mental state.

2.5.3 Shortage of Resources While Spending Needs Are Expanding

Another main challenge lies in budgeting. The pandemic resulted in immediate and unexpected financial losses, which affected budget planning. The World Bank (2020) found that domestic governments are the main sources of funding for education. Still, it also estimated that the pandemic would reduce planned increase in education spending in low- and middle-income countries, even though government spending as a whole was expected to increase as part of the pandemic response. In fact, education spending was expected to stagnate in most countries and fall in some. Public institutions which rely mainly on public funding might have found themselves facing budget cuts due to a decrease in state revenues or the changing priorities in state budgeting. Private institutions which rely much more on tuition fees collection might have found themselves also facing budgetary difficulties due to the decreasing enrollment. Lumina Foundation and Bill & Melinda Gates Foundation (2020) found from their survey of undergraduate students that the enrollment rates of public universities in the U.S. have dropped from –1.2 to –12.5% across diverse races or ethnicities.

The budgeting challenges became even more complicated when campus administrators experienced uncertainties regarding the ability to predict a variety of factors for the coming academic round. To the mid-level management, such as department heads, while they were not necessarily involved in campus-level financial conversations, it fell to them to interpret communications with staff and students. Hiring was paused, searches underway were canceled, and the procedure for spending approval became lengthy with another layer to examine the justification of the "mission critical" criterion. Department heads were asked to propose a budget reduction that averaged 10%. It took them 30 hours to figure out how to achieve this reduction in a series of meetings. Apparently, budgeting has agonized department heads who act as the mid-level management without much leverage on the high-level budgeting decisions.

2.5.4 Inclusion Becomes Even More Challenging

While racism and discrimination of all kinds are not rare in education, the pandemic seems to have worsened the situation. The existing divides which economically, socially, culturally, and politically affected the education systems have made inequalities and unprecedented serious issues in higher education. Starting from the general but varying-degree drops in enrollment, the resources that different social groups hold significantly determine whether they are able to continue their education and to be treated equally without discrimination. In one of the cases interviewed by Kruse, Hackmann, and Lindle, the institution had been diligently working to develop a comprehensive campus-wide faculty and staff professional learning program that confronted topics such as microaggression and "color-blindness." Meanwhile, other

institutions showed less assertiveness about their explicit attempts to remedy long-standing inequalities and racist practices. This is recognized as a systematic challenge. While department heads may be at the forefront of efforts to address systemic racism and inequality, they are frequently unable to effect change that results in the intended outcomes.

2.6 Lessons Learned and the Way Forwards

The case studies above showed both the positive and negative aspects of education governance in the post-pandemic times. On the one hand, the AIT experience told a successful story of how an institution can manage the crisis with clear formal structures, policy priorities, and strengthened stakeholder engagement. On the other hand, the second case study based on the experience of three department heads in the U.S. based higher education institutions showed the challenges that remain to be dealt with by most of the middle to high-level management in institutions to ensure that they can sustain another shock and that education can remain effective and of quality in the post-pandemic era.

The first case study demonstrated that higher education institutions could manage crises if they react fast enough and consider all aspects of education governance supported with policies and capacities (human, financial, and institution). Additionally, the past experiences of management of crises also supported the effective functioning of the COVID-19 response process in the institutions. The second case study highlighted the changing and increasingly important role of department heads which transcends pure management of regular practices in curriculum arrangement, budgeting, staffing, etc. In the post-pandemic era, the management will continue to be tasked with monitoring and dealing with the mental state of faculty and staff. It will have to strengthen communication and stakeholder engagement. The expectedly shrinking and limited resources should be cautiously and strategically allocated toward those in need to promote social equality and ensure the efficiency and effectiveness of education governance.

This paper has its limitations as it is purely based on the literature review. While the COVID-19 pandemic is still a threat in most parts of the world, the existing studies still largely surround the management of the crisis itself. What will or should be the post-pandemic management of education governance remains open to discussions. But, an important reflection has already been noticed that the tools of digital education governance cannot be neglected in whatever approach will be introduced by the governments and academic institutions for comprehensive management. Future research in the domain will have a lot to explore, both from different perspectives and of different levels.

Acknowledgements This paper reflects the research outcome of the multi-institutional project titled "*Disaster Education for Integrating SFDRR and SDG in Asian*" supported by ProSPER.Net UNU-IAS, Japan. We are also thankful to our project consortium partners for their support in project execution.

References

Agasisti T, Soncin M (2021) Higher education in troubled times: on the impact of Covid-19 in Italy. Stud High Educ 46(1):86–95. https://doi.org/10.1080/03075079.2020.1859689

Al-Amin M, Al Zubayer A, Deb B, Hasan M (2021) Status of tertiary level online class in Bangladesh: students' response on preparedness, participation and classroom activities. Heliyon 7(1). https://doi.org/10.1016/j.heliyon.2021.e05943

Béché E (2020) Cameroonian responses to COVID-19 in the education sector: exposing an inadequate education system. Int Rev Educ 66:755–775. https://doi.org/10.1007/s11159-020-09870-x

Carvalho S, Rossiter J, Angrist N, Hares S, Silverman R (2020) Planning for school reopening and recovery after COVID-19: an evidence kit for policymakers. Washington, DC: Center for Global Development. Retrieved August 15, 2021, from https://www.cgdev.org/sites/default/files/planning-school-reopening-and-recovery-after-covid-19.pdf

Di Pietro G, Biagi F, Costa P, Karpinski Z, Mazza J (2020) The likely impact of COVID-19 on education: reflections based on the existing literature and recent international datasets. Publications Office of the European Union, Luxembourg. https://doi.org/10.2760/126686

Dobbins M, Knill C, Vögtle EM (2011) An analytical framework for the cross-country comparison of higher education governance. High Educ 62(5):665–683. https://doi.org/10.1007/s10734-011-9412-4

Edelhauser E, Lupu-Dima L (2020) Is Romania prepared for eLearning during the COVID-19 pandemic? Sustainability 12(13):5438. https://doi.org/10.3390/su12135438

Edwards R (2014) Software and the hidden curriculum in digital education. Pedagog Cult Soc 23(2):265–279. https://doi.org/10.1080/14681366.2014.977809

El Masri A, Sabzalieva E (2020) Dealing with disruption, rethinking recovery: policy responses to the COVID-19 pandemic in higher education. Policy Des Prac 3(3):1–22. https://doi.org/10.1080/25741292.2020.1813359

Green C, Mynhier L, Banfill J, Philip E, Kim J, Desjardins R (2020) Preparing education for the crises of tomorrow: a framework for adaptability. Int Rev Educ 66:857–879. https://doi.org/10.1007/s11159-020-09878-3

Khlaif ZN, Salha S, Kouraichi B (2021) Emergency remote learning during COVID-19 crisis: students' engagement. Educ Inf Technol. https://doi.org/10.1007/s10639-021-10566-4

Kruse SD, Hackmann DG, Lindle JC (2020) Department heads leading with a focus on equity. Front Educ 5:272. https://doi.org/10.3389/feduc.2020.614641

Lumina Foundation and Bill & Melinda Gates Foundation (2020) Higher ed budgets for the post-COVID era: now's our chance to do this right. Retrieved August 20, 2021, from https://files.eric.ed.gov/fulltext/ED611326.pdf

Marks A, AL-Ali M, Attasi R, Elkishk AA, Rezgui Y (2021) Digital transformation in higher education: maturity and challenges post COVID-19. Adv Intell Syst Comput: 53–70. https://doi.org/10.1007/978-3-030-68285-9_6

Murphy A, Farley H (2017) Introduction: supporting the sustainable implementation of mobile learning for higher education in the Asia-Pacific region. Educ Asia-Pacific Reg: Issues, Conc Prospect 3–23. https://doi.org/10.1007/978-981-10-4944-6_1

OECD (2019) Chapter 4. Education governance: policy priorities and trends, 2008–19. In: Education policy outlook 2019: working together to help students achieve their potential. https://doi.org/10.1787/2b8ad56e-en

OECD (2020) The impact of the crisis on education: insights from education at a glance 2020

Pal I, Dhungana G, Shrestha S, Shaw R, Hizbaron R, Ichinose T, Oda T (2021) Building academic alliances for promoting sustainability paradigm in higher education—resilience building amid COVID-19 pandemic. In ProSPER Net. https://prospernet.ias.unu.edu/wp-content/uploads/2021/07/AIT-report.pdf

Rajatanavin N, Tuangratananon T, Suphanchaimat R, Tangcharoensathien V (2021) Responding to the COVID-19 second wave in Thailand by diversifying and adapting lessons from the first wave. BMJ Glob Health 6:e006178. https://doi.org/10.1136/bmjgh-2021-006178

Reimers FM, Schleicher A (2020) Schooling disrupted, schooling rethought: how the COVID-19 pandemic is changing education. OECD. Retrieved August 15, 2021, from https://read.oecd-ilibrary.org/view/?ref=133_133390-1rtuknc0hi&title=Schooling-disrupted-schooling-rethought-How-the-Covid-19-pandemic-is-changing-education

Souza G, Jardim WS, Junior GL, Marques YB, Lima NC, Ramos RS (2020) Brazilian students' expectations regarding distance learning and remote classes during the COVID-19 pandemic. Educ Sci: Theory Prac 20(4):65–80. https://doi.org/10.12738/jestp.2020.4.005

United Nations (2020) Policy brief: education during COVID-19 and beyond. Retrieved August 18, 2021 from https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2020/08/sg_policy_brief_covid-19_and_education_august_2020.pdf

Williamson B (2015a) Digital education governance: data visualization, predictive analytics, and "real-time" policy instruments. J Educ Policy 31(2):123–141. https://doi.org/10.1080/02680939.2015.1035758

Williamson B (2015b) Digital education governance: an introduction. Eur Educ Res J 15(1):3–13. https://doi.org/10.1177/1474904115616630

World Bank (2020) The impact of the COVID-19 pandemic on education financing. Retrieved August 20, 2021, from https://pubdocs.worldbank.org/en/734541589314089887/Covid-and-Ed-Finance-final.pdf

Xhelili P, Ibrahimi E, Rruci E, Sheme K (2021) Adaptation and perception of online learning during COVID-19 pandemic by Albanian universities students. Int J Stud Educ 3(2):103–111. https://doi.org/10.46328/ijonse.49

Chapter 3
New Perspectives on Campus Safety Initiatives at Universities

Takako Izumi, Rajib Shaw, and Hui Zhang

Abstract The COVID-19 pandemic has profoundly impacted the education sector globally. To investigate the current status of disaster preparedness capacity on campuses, the Association of Pacific Rim Universities (APRU) Multi-Hazards (MH) program conducted a survey from August to October 2020 based on the minimum checklist developed at the APRU MH campus safety workshop in 2018. This chapter aims to review the existing preparedness capacity of higher education institutions (HEIs), identify the problems and challenges in their plans based on a survey conducted using a minimum checklist, and recommend how the current preparedness measure should be improved to better prepared for future hazards, including pandemics. The survey results indicated that numerous universities improved the elements related to "Academic continuity" after the outbreak of COVID-19, i.e., by providing training courses on various educational tools and support to international students to ensure their normal progress in a full course of study. However, the results also showed that not many universities conducted even a general risk assessment on campus prior to COVID-19. Therefore, there is a need for improvement of their risk management capacity to accommodate various hazard risks. It is strongly recommended that universities review their current disaster management plans with proper risk assessment and accordingly improve their plans to be applicable to a wider range of risks.

Keywords Pandemic · COVID-19 · Disaster preparedness · Disaster response · Campus safety

T. Izumi (✉)
International Research Institute of Disaster Science, Tohoku University, Sendai, Japan
e-mail: izumi@irides.tohoku.ac.jp

R. Shaw
Graduate School of Media and Governance, Keio University, Fujisawa, Japan

H. Zhang
Department of Engineering Physics, Tsinghua University, Beijing, China

T. Izumi et al. (eds.), *Safety and Resilience of Higher Educational Institutions*,
Disaster Risk Reduction,
https://doi.org/10.1007/978-981-19-1193-4_3

3.1 Introduction

The years 2020 and 2021 have been extremely challenging for universities and the educational sectors due to the ongoing COVID-19 pandemic. Both academic and professional staff have been significantly affected by COVID-19 (Tria 2020; Brammer and Clark 2020). According to United Nations Educational, Scientific, and Cultural Organization (UNESCO) reports, more than 1.5 billion students in approximately 165 countries have been affected by the lockdown of schools and campuses. As a result, they were forced to shift to online learning as a replacement for onsite delivery (Osman 2020; Boeren et al. 2020; Zhu and Liu 2020; Mishra et al. 2020; Ifijeh and Yusuf 2020; Kedraka and Kaltsidis 2020).

This transformation has imposed tremendous stress on students, faculty, and university staff due to factors such as the deficiency of online teaching infrastructure, the inexperience of teachers, the information gap, and the complex enrollment at home. It has put pressure on institutional systems of quality assurance and governance, and the workload for faculty and professional staff has increased (Ali 2020; Husky et al. 2020; Brammer and Clark 2020; Yang et al. 2020; Sundarasen et al. 2020; Tang et al. 2020; Islam et al. 2020).

Furthermore, a study showed that university students exhibited higher anxiety than the general population after the outbreak of COVID-19 (Wang and Zhao 2020; Marelli et al. 2021; Husky et al. 2020). A significant increase in psychological distress and symptoms of mental illness in the general population has been noted as well (Marelli et al. 2021; Aristovnik et al. 2020). In addition, the broader economic impacts of COVID-19 have led to a significant number of students experiencing hardship due to the reduction of part-time work (Brammer and Clark 2020). The longer the confinement period, the stronger and more serious the stress and psychological problems could be.

Even prior to this pandemic, universities were affected by a series of disasters (e.g., natural, pandemic, chemical, and technological) that caused serious disruptions in teaching, research, and various activities as well as financial damage. Damage to buildings, assets, and infrastructure often caused significant financial losses. Based on these experiences, universities developed or strengthened the preparedness and response capacities on campus through disaster management planning, evacuation drills, and risk information sharing and awareness raising (Jaradat et al. 2015; Izumi 2018). These preparedness activities helped universities reduce and mitigate potential damage and impacts (Izumi et al. 2020). However, there are several critical questions to be answered. How useful has the current and existing preparedness been in tackling and dealing with the COVID-19 pandemic, and how effectively have universities responded to the pandemic with the current preparedness capacities? What areas are most advanced, and which require further enhancement? Does the current preparedness plan cover the pandemic and other hazards too?

This chapter aims to review the existing preparedness capacity of higher education institutions (HEIs), identify the problems and challenges in their plans based on a survey conducted using a minimum checklist, and recommend how the current preparedness measure should be improved to better prepare for future hazards, including pandemics.

3.2 University Disaster Preparedness

There are several critical roles of universities in disaster management: (1) to contribute to disaster risk reduction conducted by governments and other actors through intensive research on disasters and disaster management from different perspectives, including natural science, engineering, social science, medicine, and humanities; (2) to conduct training courses for government officials and disaster-related persons and incorporate disaster management into their traditional curriculum; and (3) to strengthen their own disaster management capacity on campus (Mishra et al. 2020). These three roles are crucial for universities to contribute to disaster risk reduction (DRR) for their own country, community, and university. The first two roles aim to provide support to other entities such as governments to strengthen their preparedness and response capacities. The third requires universities to take action to increase their preparedness capacity but not to assist other entities. Universities have a tremendous responsibility for the safety of students, faculty, and university staff on campus. Therefore, having strong preparedness and response capacities and infrastructure in advance is critical for protecting their lives and ensuring continual education and teaching, even after being affected by a disaster.

To determine the disaster preparedness capacity on campus and identify the challenges and issues to strengthen the universities' disaster preparedness capacity, the Multi-Hazards (MH) program under the Association of Pacific Rim Universities (APRU), a network of 57 universities (as of April 2021) in the Pacific Rim, surveyed their member universities in 2015. Twenty-two universities responded to the survey in 2015. The survey questionnaires comprised six categories, namely governance actions, risk assessment, disaster preparedness mechanism and capacity, response capacity, support system for students, faculty members and staff, and data reservation. The survey results highlighted that more than half of the universities did not conduct a proper risk assessment on campus and that universities must further strengthen their risk assessment. Moreover, only 36% of the universities that conducted the assessment devised a preparedness strategy and developed a work and action plan based on the assessment results (APRU and IRIDeS 2015). It was also identified that financial constraints, human resource challenges, difficulties in understanding the risks and safety issues, and a lack of faculty and staff participation were major difficulties for universities to further enhance their disaster preparedness measures (Izumi 2018). The fact that not many universities have conducted risk assessment on

campus is a fundamental problem. Consequently, it is extremely difficult for universities to develop a preparedness and response strategy and to discuss preparations for the next disaster.

Furthermore, a number of universities also developed a disaster management plan. These plans are often developed based on an all-hazards approach and target different types of hazards, such as natural, biological, technological, chemical, and human-made attacks (Izumi et al. 2020). However, in some cases, universities developed a separate plan focused on a particular hazard such as a pandemic. The main reason for developing a separate plan for a pandemic is its unique challenges, such as uncertainty related to its incubation and lasting periods, the possibility of new waves of illness, the severity of the damage, and a rapid increase in the number of infected individuals over a short period of time.

In principle, as a general disaster management plan, a pandemic response and preparedness plan define the roles and responsibilities of offices and individuals, such as the incident response team, incident commander, university police, president and cabinet, health center, and academic affairs. It is based on the level of the situation: Stage 1—confirmed case of human-to-human transmission of a pandemic in the US; Stage 2—suspected case on campus or suspected/confirmed cases in the state/area where universities are located; and Stage 3—confirmed cases on campus (Humbolt State University 2009; Roger Williams University 2010; The University of Mississippi n.d.; University of South Alabama 2004). The levels can also be divided into 3 to 5 based on the action/decision made by the university, such as all operations normal/emergency planning in progress; all classes and significant events canceled/other operations open as usual; all university operations canceled; and university evacuated (Ball State University 2020; The University of Mississippi n.d.; Indiana State University n.d.; University of South Alabama 2004).

In addition, these plans also state the actions that need to be taken at every stage. These actions include travel constraints, class suspension, social distancing, academic consideration (e.g., the timing for a tuition refund, scheduling of classes, and matriculation of new students), communication, and absenteeism (University of Alaska 2009; University of Pittsburgh at Bradford 2009; University of Guelph 2019).

However, so far, no plans that suggest considering the possibility of and need for the transformation of education mode from face-to-face to online instead of completely suspending education and teaching have been found. This could have caused a delay and difficulty of shifting their education and teaching format from face-to-face to online. Moreover, the necessary infrastructure for such transformation has not been well-prepared. This may be because no one expected or considered the impact on education and teaching imposed by a pandemic that could last that long.

The Centers for Disease Control and Prevention (CDC) developed a pandemic influenza planning checklist as a framework for colleges and universities to assist them in developing and/or improving plans to be prepared for and respond to an influenza pandemic. The checklist consists of four categories: (1) planning and coordination; (2) continuity of student learning and operations; (3) infection control policies and procedures; and (4) communications planning. In the second category, continuity of student learning and operations, it is recommended to “Develop and

disseminate alternative procedures to assure continuity of instruction (e.g., web-based distance instruction, telephone trees, mailed lessons and assignments, and instruction via local radio or television stations) in the event of college/university closures." The term used is "instruction" and not "education" because it did not predict the transition of the education mode to online and the long-term closure of classes (CDC 2006).

Therefore, the existing pandemic plans did not foresee the level of the current pandemic damage and were not developed while expecting its long-lasting impact on teaching and learning. However, the COVID-19 pandemic experience provided us with an opportunity to review the current plans and consider what kind of preparation is needed to respond to a future pandemic promptly and efficiently.

3.3 Survey on the Current Status of University Preparedness Capacities

The APRU MH program, in collaboration with Tohoku University, Keio University, and Tsinghua University, conducted another survey from August to October 2020 to examine and assess the current preparedness capacities on campuses in Asia and identify their problems and challenges to minimize damage from future hazards. In addition to the survey, universities were requested to share their experience about their response and preparedness for the COVID-19 pandemic as a case study.

3.3.1 Survey Methodology

The questionnaire was created based on the minimum checklist for university preparedness developed at the APRU MH campus safety workshop in 2018. The MH program was established in 2013 jointly with APRU and Tohoku University to enhance the collective capabilities of APRU universities for cutting-edge research on the shared threat of various hazards encountered by the region. One of the major activities under the MH program is the campus safety program, which aims to strengthen disaster preparedness capacity on the campus. The program organizes a workshop every 2 years for the APRU member universities to discuss the challenges and concerns related to disaster preparedness and learn from each other's experience. At the workshop held in 2018, it was proposed to develop a minimum checklist to assess their disaster preparedness and share it as a common standard for the APRU member universities in order to strengthen the natural hazard preparedness capacity on campus. It was revisited at another workshop held in 2020 to examine whether it is applicable to other hazards too, especially for the ongoing pandemic. Subsequently, it was finalized with a new category of "academic continuity." The questionnaire for

this survey used this revised checklist consisting of 35 indicators in six categories and asked (1) to assign a score (from 1 to 5) to the current status measured by each indicator and (2) to select the most suitable timeframe (short, medium, and long) to improve the current status of each indicator.

To ensure the quality of the responses, the form was sent directly to individuals who attended the former campus safety workshops or others through university networks such as the APRU and the International Research for Disaster Risk (IRDR). They were experts who have been involved in both DRR and crisis management for several years and who are familiar with campus safety issues. Twenty-three responses to the questionnaire from 21 universities in 13 countries (Bangladesh, China, India, Indonesia, Japan, Mexico, Malaysia, Myanmar, Pakistan, Philippines, Singapore, Taiwan, and Thailand) and 24 case studies by 17 universities in 13 countries and regions were collected.

3.3.2 Result/Analysis

3.3.2.1 Policy/Governance

This category includes nine indicators related to universities' policies and governance, such as BCP, an evacuation plan, and early warning (Table 3.1). The indicators with the highest average were: "The university sets up a disaster countermeasure office once a disaster strikes" and "The university has developed an evacuation plan to accommodate students and staff." In addition, many universities have "a disaster emergency plan" and are equipped with "an early warning" system. All these plans are critical for understanding the procedures in the case of emergencies, how to continue education and campus life on campus, and how to evacuate students, staff, and faculty promptly and safely. In addition, these plans indicate how to respond to the emergency and recover from it and how to continue the regular university curriculum and education.

However, these plans were not reviewed and updated each year. The indicator "The plan is reviewed and updated each year" had the lowest score. Review and updating of plans are critical. The types, severity, and timing of disasters change; therefore, universities need to assess whether their plans could be applied to tackle all potential risks and people could obtain all the information necessary to respond to emergencies, as well as what actions need to be taken by personnel and offices.

3.3.2.2 Risk Management

This category includes six indicators related to risk management (Table 3.2). Risk management requires determining the risks and identifying how to reduce them and what kind actions need to be taken for risk reduction. "Understanding disaster risks" was addressed as Priority 1 in the Sendai Framework for Disaster Risk Reduction

Table 3.1 Average scores of indicators under Category 1

Category	No.	Evaluation criteria	Average score
1: Policy/governance	1.1	The university has a disaster emergency plan (communication, electricity backup, emergency structure) and BCP that target various types of hazards	3.5
	1.2	Staff and faculty are familiar with the plan and understand how to act in case of emergencies. The plan needs to be simulated with the involvement of senior managers	3.1
	1.3	The plan is reviewed and updated each year	2.7
	1.4	The university sets up a disaster countermeasure office once a disaster restrikes	3.7
	1.5	A disaster emergency drill is conducted at least once a year	3.4
	1.6	A safety confirmation plan for students, staff, and faculty is put in place	3.2
	1.7	The university has developed an evacuation plan to accommodate students and staff	3.7
	1.8	The necessary support (both financial and technical) to strengthen the preparedness for future disasters and mitigate risks such that the development of a BCP is provided to departments and institutes under universities	3.0
	1.9	An early warning is issued if necessary and possible	3.5

Table 3.2 Average scores of indicators under Category 2

Category	No.	Evaluation criteria	Average score
2: Risk management	2.1	A risk assessment is conducted and updated regularly, at least annually	2.8
	2.2	A mitigation/risk reduction/preparedness plan is developed	3.2
	2.3	Based on the plan, mitigation measures are put in place	3.0
	2.4	Emergency supplies (e.g., food, water, and blankets) are always available	2.9
	2.5	All the measures are regularly checked whether they are still effective or not	3.1
	2.6	Signage boards to alert dangerous zones or ongoing construction works need to be set up	3.5

(SDFRR) adopted in 2015 at the UN World Conference on Disaster Risk Reduction (UNISDR 2015), and it is the foundation of DRR efforts.

The highest score was obtained for "Signage boards to alert dangerous zones or ongoing construction works need to be set up." It could easily and quickly be implemented at a lower cost to set up signage boards compared to other DRR measures.

The lowest score was obtained for "A risk assessment is conducted and updated regularly, at least annually." Thus, this is a critical issue. The survey conducted in 2015 by the APRU Multi-Hazards program also showed that "a risk assessment" was the lowest element in disaster preparedness. Without conducting a risk assessment, hazard risks are not identified, and accordingly, these risks cannot be reduced. It is crucial to examine why it is not pursued, why is it difficult for universities to conduct such an assessment, and what the obstacles are to initiating and updating the assessment. Universities possess significant expertise in risk identification and assessment in their faculty and are required to make the best use of it.

3.3.2.3 Physical Infrastructure

The highest score was obtained for the following two areas: "Buildings are facilitated by drainage, electricity, fire alarm system, sprinkler and fire extinguisher, etc.," and "Maintenance work is periodically conducted in buildings" (Table 3.3). No university assigned score "1" (lowest) for these two indicators, and each was assigned score "2" only once.

In contrast, the lowest score was obtained for "Technological tools such as satellite/mobile emergency phones, alarms, and drones are put in place. Staff needs to be trained on how to use these emergency tools regularly." The results indicated that these advanced technology tools and equipment have not been effectively used yet. This may be attributed to costs required to replace the current equipment and adopt more advanced ones. However, it is critical to consider this as an investment and not just as additional costs.

3.3.2.4 Awareness Training Courses/Education

All the scores of the indicators of this category were relatively low (Table 3.4). The highest score was only 3.3, obtained for "A disaster emergency drill is conducted under each department/institution." Therefore, even though it is the highest score in this category, there is room for improvement for many universities.

Moreover, the gap between the highest and lowest scores was only 0.3, which is a small difference. The lowest score was obtained for "Orientation on a disaster emergency and preparedness plan is conducted for freshmen students for various types of hazards." Not many universities communicate the information on the procedures and plans in case of emergencies, especially to freshmen students, and most likely on hazard risks. Since students enter the university from other parts of the country,

Table 3.3 Average scores of indicators under Category 3

Category	No.	Evaluation criteria	Average score
3: Physical infrastructure	3.1	Buildings have earthquake-resistant structure	3.3
	3.2	Buildings are equipped with drainage, electricity, fire alarm systems, sprinklers, and fire extinguishers	4.0
	3.3	Maintenance work is periodically conducted in buildings	4.0
	3.4	Building inspection takes place regularly	3.9
	3.5	Critical information in case of emergencies, such as evacuation routes and emergency assembly points, is shared with students, faculty, and staff. Ideally, these facilities have the signage	3.6
	3.6	IT recovery plan is developed. It is necessary for staff to be trained on cyber security	3.2
	3.7	Technological tools, such as satellite/mobile emergency phones, alarms, and drones, are put in place. Staff needs to be trained on how to use these emergency tools regularly	3.0

Table 3.4 Average scores of indicators under Category 4

Category	No.	Evaluation criteria	Average score
4: Awareness training/education	4.1	Orientation on a disaster emergency and preparedness plan is conducted for freshman students for various types of hazards	3.0
	4.2	Special guidance to foreign students is available	3.1
	4.3	Safety protocol for the students abroad is given prior to their departure	3.2
	4.4	A disaster emergency drill is conducted under each department/institution	3.3
	4.5	Awareness-raising programs, including understanding hazard maps and training courses, for students, staff, faculty, and a DRR leader on campus such as on CPR are conducted	3.1
	4.6	Information materials on past disasters and emergency plans are distributed	3.2

Table 3.5 Average scores of indicators under Category 5

Category	No.	Evaluation criteria	Average score
5: Physical/psychological aid	5.1	There is a hotline in place for students, staff, and faculty when they need physical and psychosocial support during and after emergencies	3.8
	5.2	There is a prior agreement with local government, organizations, and other universities on collaboration and mutual support in case of emergencies, including volunteer registration	3.7

they may not be familiar with the hazard situations in the university area. Thus, it is critical to inform them about the disaster risks and how to respond to these events on campus.

3.3.2.5 Physical/Psychological Aid

This category has only two indicators; however, both gained high scores (Table 3.5). In particular, 11 universities, which is almost 50% of the surveyed universities, assigned the highest score "5" to "There is a hotline in place for students, staff, and faculty when they need physical and psychosocial support during and after emergencies"; and only one university assigned the lowest score "1". Furthermore, it is well-recognized that collaboration with local governments, organizations, and other universities is crucial in responding to emergencies. Accordingly, it is important to have a prior agreement regarding activities such as arranging volunteers.

3.3.2.6 Academic Continuity

This category was relatively well-covered (Table 3.6). The indicator with the highest score in this category was "The support to international students to ensure they can continue to make normal progress in a full course of study is provided;" and it also obtained the highest score among all 35 indicators. Particularly, international students have encountered unexpected challenges and difficulties during the COVID-19 pandemic, including financial constraints due to losing an opportunity for a part-time job and not being able to go back to their countries and see their families. Thus, they need strong support and encouragement from universities. Under such circumstances, it is encouraging that most responding universities managed to provide necessary support and guidance to international students. In addition, the results showed that training courses/information on various educational tools have been provided to faculty at most surveyed universities.

Table 3.6 Average scores of indicators under Category 6

Category	No.	Evaluation criteria	Average score
6: Academic continuity	6.1	A guideline that determines if, when, and for how long the university needs to suspend classes and postpone or cancel events and research activities and that explains the alternatives	3.4
	6.2	Students, faculty, and staff are familiar with a different mode of education in case of emergencies	3.8
	6.3	Training courses/information on various educational tools such as online lecturing are provided to faculty. A guideline and manual on different educational tools/modes are also available	4.2
	6.4	There is immediate support to students and faculty for giving/receiving online classes such as stable Internet access	3.8
	6.5	Support for international students to ensure they can continue to make normal progress in a full course of study is provided	4.3

In contrast, the lowest score was obtained for "A guideline that determines if, when, and for how long the university needs to suspend classes and postpone or cancel events and research activities and that explains the alternatives." It is paramount to establish these guidelines in advance to be able to provide the information on restarting the classes and the cancelation of events in a timely manner. It could become one of the lessons learned from the experience of the COVID-19 pandemic, and universities are expected to take advantage of this experience to be better prepared for the next hazard.

3.3.3 Timeframe for Improvement

In addition to reviewing the current preparedness capacity on campus based on the minimum checklist, the survey also asked about the timeframe required for the improvement of each indicator if not yet implemented or put in place. Out of 35 indicators, the universities responded that 31 indicators need to be improved within 2 years (short term).

For three indicators under category 1 (1.1, 1.2, 1.8), most universities responded that they will improve in 3–5 years rather than in 2 years (Table 3.7). For only one indicator under category 3 (3.1), there were more answers stating that it will require more than 5 years to improve (Table 3.8). The results imply that most of the

Table 3.7 Indicators required 3–5 years for improvement

3–5 years (medium term)				
	Category	No.	Criteria	3–5 years required (%)
1	Policy/Governance	1.1	The university has a disaster emergency plan (e.g., communication, electricity backup, emergency structure)	70
2	Policy/Governance	1.2	Staff and faculty are familiar with the plan and understand how to act in case of emergencies. The plan needs to be simulated with the involvement of senior managers	63
3	Policy/Governance	1.8	The necessary support (both financial and technical) to strengthen preparedness for future disasters and mitigate risks, such as the development of a BCP, is provided to departments and institutes under universities	43

Table 3.8 Indicators required more than 5 years for improvement

More than 5 years (long term)				
	Category	No.	Criteria	Long term required (%)
1	Physical infrastructure	3.1	Buildings have earthquake-resistant structure	53

activities aimed at improving the disaster preparedness capacity on campus can be done in 2 years if sufficient human resources, budget, and expertise are provided. Depending on the support and decision by the management level, it is possible to increase the capacity in a 2-year period, be well-prepared for the next hazard, and reduce the damage tremendously.

The results showed that the issues under category 1 (policy/governance), and category 3 (physical infrastructure), will require more time than other categories. Accordingly, it is necessary to initiate the improvement process immediately not to cause any extra damage and impact by the future hazard. This category requires immediate actions.

3.4 Case Studies

Together with the survey, 23 case studies on the response to the COVID-19 pandemic and other hazards on campus were collected (Tohoku University 2021). Most case studies focused on the response to COVID-19 by universities and measures taken after the outbreak but also targeted other hazards, such as earthquakes, floods, fires, terrorist attacks, and protests. Each case study was requested to include the information on major damage and impacts, major preparedness measures, response efforts, recovery efforts, lessons learned from the event, and major changes and improvements in disaster risk management.

3.4.1 Responses

As for the major damage and impacts on campus caused by COVID-19, all universities addressed the shift to online classes, postponement/cancelation of the academic ceremonies/activities, and travel. Furthermore, some universities added the following as the damage and impacts: financial burden to invest in online infrastructure, IT-related systems, and creation of off-campus learning and teaching support; contractual staff risk unemployment; and mental stress on the staff, students, and faculty. Most of the universities requested the students, staff, faculty to wear masks on campus, installed sanitizers in many places on the campus and in buildings, and conducted the disinfection of classrooms/buildings regularly. In addition, one university actively tried to develop new tools using technologies and research to reduce the COVID-19 impact. Moreover, this university made available buildings and facilitates for quarantine, even open to nearby communities/villagers, while waiting for test results or when it is difficult to isolate themselves from their families.

- University campuses were utilized as quarantine centers (Nepal).
- University set up a community isolation facility with a capacity of 26 beds for those suspected of having COVID-19, patients with mild symptoms, and those waiting for the results of swab tests but who were unable to quarantine at home. It was also open to those nearby villagers who could no longer be accommodated at the isolation facilities sponsored by the village (Philippines).
- The university's engineering faculty members and students created several technologies and projects to help to reduce the risk and impact of COVID-19 including Telepresence (technologies that help medical staff care for COVID-19 patients via telecommunication) and Quarantine Delivery Robot (help medical staff care for COVID-19 patients via telecommunication and by delivering foods to them through long-range control).

3.4.2 Lessons Learned

Most of the universities answered that it has been necessary to diversify their current education form using various tools and information technology. Additionally, universities realized that the pandemic is one of the hazards and disasters, and accordingly, their current crisis response/preparedness plan must be developed to accommodate and deal with other hazard types beyond natural hazards.

Moreover, one of the lessons learned is the importance of raising awareness of public health and how to avoid being infected by a virus in regular times. This pandemic experience increased the awareness of other hazards and the importance of preparedness and compared them with rescue and recovery efforts. The impact of the pandemic will be prolonged and affect the university operation, financial aspects, and education in many ways. To strengthen university resilience, new technologies and digitalization could be a strong solution. In this respect, universities and research institutes can play a significant role in future risk mitigation through their advanced research and experiments.

- Strengthening awareness of epidemic prevention and emergency response capacity by public health and safety education and establishing an emergency security mechanism for a major epidemic (China).
- The crisis management plan must include a deliberately explained epidemic/pandemic action plan (Malaysia).
- Awareness of the pandemic, especially its prevention and mitigation, should be improved to ensure total compliance among the campus community (Malaysia).
- COVID-19 was the first major disaster experience for the university; therefore, the university is now highly conscious of pandemics but also of other types of disaster risks (Malaysia).
- This pandemic has taught us about important aspects of the interaction of science, society, and nature with humankind (Nepal).
- University officials realized that preparedness and mitigation of potential risk are always more important than rescue and recovery; preparation of contingency plans for possible hazards is important to build community resilience (Nepal).
- The pandemic has provided strong lessons about strengthening public health policies and systems, building capacity in human health care resources, and investing in health infrastructure (Nepal).
- A pandemic can affect all aspects of university operations and disrupt supply chains (Singapore).
- The university needs to launch digital solutions promptly to keep pace with new control measures (Singapore).
- The risk management plan should be reexamined to focus on a variety of risks and disasters (Thailand).

3.4.3 Major Changes

Most of the changes made after the COVID-19 outbreak were aimed at enhancing their current preparedness and response plans to include the pandemic as one of the targets and coverage under the plan. In addition, COVID-19 raised awareness and interest of the whole campus in disaster risk management. There was a university that took prompt action to change the design of the standards for the construction of new workplaces with touchless surfaces.

- Paying more attention to prior management of campus disaster risk (China).
- Further strengthening cooperation and linkage among various departments of the school (China).
- Paying more attention to and strengthening the publicity, education, and exercise of public health knowledge. Improving the school public health emergency management system (China).
- Paying more attention to deepening development and application of the campus security information platform (China).
- Enhanced epidemic/pandemic SOP in the Crisis Management Plan (Malaysia).
- Strengthened liaison and collaboration with local authorities and government agencies, namely the State Health Department, Ministry of Higher Education, Ministry of Health, and Dept. of Safety and Health (Malaysia).
- Changes in design standards for the construction of new workspaces (toward touchless surfaces) (Singapore).
- More attention paid to health, sanitation, and other practices related to reducing the risk of spreading disease and the development of an emergency management plan (Sri Lanka).
- Apart from the current focus on COVID-19, multi-hazards have been taken into consideration, together with the development of new technologies (Thailand).

3.5 Discussion

Based on the results of the survey, a comparison of five categories revealed that "academic continuity" was ranked first, followed by "physical/psychological aid," with a narrow margin (Table 3.9). Since this survey was conducted from August to October 2020, which was amid the COVID-19 pandemic, it is considered that many universities have particularly improved the elements under category 6 (academic continuity) after the COVID-19 outbreak and before this survey was conducted. This category showed that academic continuity has been supported with various training courses and with guidelines and manuals on educational tools and platforms. Moreover, necessary support has been provided to international students to ensure the continuation of their studies. Academic continuation is one of the most important responsibilities for universities.

Table 3.9 Average scores for each category

Category	1: Policy/governance	2: Risk management	3: Physical infrastructure	4: Awareness training/education	5: Physical/psychological aid	6: Academic continuity
Average	3.3	3.1	3.6	3.2	3.8	3.9

In contrast, the lowest score was obtained for category 2 (risk management), and the second lowest was category 4 (awareness training/education), with a narrow margin. Category 2 includes six indicators related to risk assessment, a preparedness plan, mitigation measures, and emergency supplies. These indicators are critical for universities; however, compared to other categories such as physical infrastructures, physical/psychosocial aid, and academic continuation, the achievements are still low. Category 4 includes six indicators related to orientation on disaster preparedness, guidance to foreign students, a disaster emergency drill, awareness raising programs, and sharing information materials. These activities require considerable expertise to develop materials and information, preparatory works, and coordination works to arrange seminars and learning/information sharing opportunities. In contrast to the US and Australia, most of the universities in Asia do not have a crisis/emergency management office with security experts that could be responsible for taking actions under categories 2 and 4. Instead, faculty members need to contribute to facilitating and implementing these efforts. Under such circumstances, strong leadership at the management level of universities is critical to involve faculty members with such expertise in disaster preparedness and management activities as their important duties.

Among all 35 indicators, the top five with the highest scores and five with the lowest scores are as follows (Table 3.10).

The top two indicators are from "academic continuity." This is because universities put extra effort into provide particular support for international students to enable them to continue study and life on campus. It is also proved that many universities took prompt action to conduct training courses and seminars on new tools and platforms for a new mode of education and teaching.

Table 3.10 Indicators in Top 5

Highest				
	Category	No.	Criteria	Score
1	Academic continuity	6.5	Support for international students to ensure they can continue to make normal progress in a full course of study is provided	4.3
2	Academic continuity	6.3	The training courses/information on various educational tools such as online lecturing are provided to faculty. A guideline and manual on different educational tools/modes are also available	4.2
3	Physical infrastructure	3.2	Buildings are equipped with drainage, electricity, fire alarm systems, sprinklers, and fire extinguishers	4.0
3	Physical infrastructure	3.3	Maintenance work is periodically conducted in buildings	4.0
5	Physical infrastructure	3.4	Building inspection takes place regularly	3.9

Table 3.11 Indicators in Lowest 5

Lowest				
	Category	No.	Criteria	Score
1	Policy/Governance	1.3	The plan is reviewed and updated each year	2.7
2	Risk management	2.1	A risk assessment is conducted and updated regularly, at least annually	2.8
3	Risk management	2.4	Emergency supplies are always available	2.9
4	Policy/Governance	1.8	Necessary support to strengthen preparedness for future disasters and mitigate the risks, such as the development of a BCP, is provided to departments and institutes under universities	3.0
4	Risk management	2.3	Based on the plan, mitigation measures are put in place	3.0

Furthermore, three indicators in the top five are from "physical infrastructure." Strengthening building structure, equipment, maintenance, and inspection is recognized as a part of major and critical DRR measures. The results showed that many universities have already taken an initiative for DRR by strengthening their building infrastructure and recognizing that infrastructure development is critical for DRR.

Five indicators with the least progress are from the category of "policy/governance" and "risk management" (Table 3.11). Consequently, universities need to focus more on reviewing and updating the existing preparedness and response plan and conducting a risk assessment. It is urgently required to check whether the current plan could be applied to the pandemic and other hazards beyond natural hazards to respond effectively in a timely manner providing necessary assistance and support to students, faculty, and staff.

The results also showed that universities are not always ready to provide sufficient support by sharing emergency supplies in a timely manner. Furthermore, one of the problems is that they have not received enough support to strengthen their preparedness capacity such as developing a business continuity plan. It was also pointed out that one of the challenges to strengthening the disaster preparedness capacity on campus is the lack of financial support and human resources (Izumi 2018). As stated in the SFDRR as priority 3, the investment in DRR is crucial, and it is the same for universities. DRR cannot be done without sufficient human resources, expertise, and financial support, and universities need to consider DRR as an investment. The results demonstrated that (1) mitigation measures based on a proper assessment and by universities; (2) regular updates; and (3) support for preparedness are far from sufficient.

3.6 Conclusion and Recommendations

COVID-19 has posed a tremendous challenge to universities' core activities of supporting the development of students in education and teaching. Consequently, universities worldwide have encountered sudden pressure to change from face-to-face delivery of courses to digitally enhanced teaching for distance learning (Kedraka and Kaltsidis 2020).

The most significant problem regarding this change is that not all students equally benefit from the various remote learning approaches (Habler et al. 2020). Some universities had an experience of digital learning prior to the pandemic, and they had improved their infrastructure for good Internet access. In contrast, without such infrastructure, especially universities in developing countries had significant difficulties allocating a budget for this purpose (Mondol and Mohiuddin 2020).

Some positive aspects could include that moving online made teaching and learning accessible anywhere at any time with some innovation in online education models (Rahiem 2020; Wang et al. 2020). The global pandemic opened up opportunities to universities to upgrade its educational mode of delivery and transfer its attention to emerging technologies (Toquero 2020). It also enabled learning from experts from all over the world without traveling to conferences and events. Moreover, remote education tools have enabled external partners to play a more prominent role in many aspects of the curricula. A variety of alternative ways of helping students to continue their learning and designing new forms of learning support and assessment were created due to the COVID-19 experience (Brammer and Clark 2020).

The survey identified positive improvements resulting from COVID-19 as follows:

- The current management plan was reviewed quickly and revised to incorporate the risk management from other hazards in addition to the pandemic but also other potential hazards as well. After revising the plan, it is crucial to review and update it regularly.
- Universities provided various support to governments in sharing research findings. Numerous collaborative works with different stakeholders, such as the private sector and government entities, are ongoing in developing innovative solutions and guidelines/strategies.
- A number of innovative ideas were turned to products, such as Telepresence and Quarantine Deliver Robot.
- Most of the elements listed in the minimum checklist will be improved within 2 years if universities could secure sufficient budget, human resources, and expertise.

The major areas for improvement are as follows:

- Universities are required to conduct the risk assessment thoroughly in advance and develop a plan based on the assessment result. The plans also need to be reviewed and updated regularly.
- Awareness-raising activities also need to be strengthened further, especially for freshman and foreign students.

- More attention must be paid to strengthening cooperation and linkage among various departments within universities.
- The current emergency plan needs to incorporate a public health element.

The COVID-19 pandemic shed light on other hazard risks that we have not thought about before. In addition to natural hazards and pandemics, it is crucial to thoroughly assess and consider whether there are other hazards risks that need to be considered and prepared for on campus.

This survey mainly targeted the Asian region, and other regions may have different results. The struggle with COVID-19 still continues. More innovative ways of teaching and learning as well as different types of challenges for universities may be addressed in a later stage. For a future research possibility, it will be important to conduct the same type of survey in the whole regions and make a comparative analysis in order to learn from each other and improve the issues based on the lessons learned from other regions' cases.

References

Ali W (2020) Online and remote learning in higher education institutes: a necessity in light of COVID-19 pandemic 2020. High Educ Stud 10(3). https://doi.org/10.5539/hes.v10n3p16

APRU (2015) APRU-IRIDeS Multi-Hazards program: campus safety report 2015. Available at: http://aprumh.irides.tohoku.ac.jp/app-def/S-102/apru/wp-content/themes/APRU-IRIDeS/img/page/MHPCSR2015.pdf. Accessed 1 Apr 2020.

Aristovnik A, Kerzic D, Ravselj D, Tomazevic N, Umek L (2020) Impacts of the COVID-19 pandemic on life of higher education students: a global perspective. Sustainability 12:8438. https://doi.org/10.3390/su12208438

Ball State University (2020) Influenza pandemic operations plan. Accessed from https://www.bsu.edu/-/media/www/departmentalcontent/emergencyresponse/influenza-pandemic-plan.pdf. Accessed 1 Mar 2021

Boeren E, Roumell EA, Roessger KM (2020) COVID-19 and the future of adult education: an editorial. Adult Educ Q 70(3):201–204

Brammer S, Clark T (2020) COVID-19 and management education: reflections on challenges, opportunities, and potential futures. Br J Manag 31:453–456

Centers for Disease Control and Prevention (CDC) (2006) Colleges and universities pandemic influenza planning checklist. Accessed from https://www.cdc.gov/flu/pandemic-resources/pdf/colleges_universities.pdf. Accessed 1 Mar 2021

Habler B, Khalayleh A, McBurnie C (2020) A five-part education response to the COVID-19 pandemic. In: EdTech Hub Helpdesk Response No. 5. https://doi.org/10.5281/zenodo.3756012

Humbolt State University (2009) Pandemic planning, response, and business continuity plan. Accessed from https://risksafety.humboldt.edu/sites/default/files/risksafety/pandemic_plan.pdf. Accessed 1 Mar 2021

Husky MM, Kovess-Masfety V, Swendsen JD (2020) Stress and anxiety among university students in France during COVID-19 mandatory confinement. Compr Psychiatry 102:152191

Ifijeh G, Yusuf F (2020) COVID-19 pandemic and the future of Nigeria's university system: the quest for libraries' relevance. J Acad Librariansh 46:102226. https://doi.org/10.1016/j.acalib.2020.102226

Indiana State University (n.d.) Indiana state university pandemic operations plan. Accessed from https://www2.indstate.edu/pubsafety/docs/Final%20Pandemic%20Plan.pdf. Accessed 1 Mar 2021

Islam MS, Sujan MSH, Tasnim R, Sikder MT, Potenza MN, Os, JV (2020) Psychological responses during the COVID-19 outbreak among university students in Bangladesh. PLoS One 15(12):e0245083. https://doi.org/10.137/journal.pone.0245083

Izumi T (2018) Investing in disaster risk reduction: implications for science and technology based on case studies from the local and national governments, the private sector and a university network. Science and technology in disaster risk reduction in Asia—potentials and challenges. Academic Press, Elsevier, pp 221–237

Izumi T, Sukhwani V, Surjan A, Shaw R (2020) Managing and responding to pandemics in higher educational institutions: initial learning from COVID-19. Int J Disaster Resil Built Environ 12(1):51–66. https://doi.org/10.1108/IJDRBE-06-2020-0054

Jaradat A, Mziu H, Ibrahim J (2015) Disaster preparedness in universities. Int J Comput Trends Technol 19(1):1–4

Kedraka K, Kaltsidis C (2020) Effects of the COVID-19 pandemic on university pedagogy: students' experiences and considerations. European J Educ Stud 7(8). https://doi.org/10.46827/ejes.v7i8.3176

Marelli S, Castelnuovo A, Somma A, Castronovo V, Mombelli S, Bottoni D, Leitner C, Fossati A, Ferini-Strambi L (2021) Impact of COVID-19 lockdown on sleep quality in university students and administration staff. J Neurol 268:8–15

Mishra L, Gupta T, Shree A (2020) Online teaching-leaning in higher education during lockdown period of COVID-19 pandemic. Int J Educ Res Open 1:100012

Mondol M, Mohiuddin MG (2020) Confronting COVID-19 with a paradigm shift in teaching and learning: a study on online classes. Int J Social Polit Econ Res 7(2):231–247

Osman ME (2020) Global impact of COVID-19 on education systems: the emergency remote teaching at Sultan Qaboos University. J Educ Teach Vil 45(4):463–471

Rahiem MD (2020) The emergency remote learning experience of university students in Indonesia amidst the COVID-19 crisis. Int J Learn Teach Educ Res 19(6):1–26

Roger Williams University (2010) Pandemic response plan. Accessed from https://www.rwu.edu/sites/default/files/ehs_pandemic_response_plan.pdf. Accessed 1 Mar 2021

Sundarasen S, Chinna K, Kamaludin K, Nurunnabi M, Baloch GG, Khoshaim HB, Hossain SFA, Sukayt A (2020) Psychological impact of COVID-19 and lockdown among university students in Malaysia: implications and policy recommendations. Int J Environ Res Public Health 17:6206. https://doi.org/10.3390/ijerph17176206

Tang W, Hu T, Hu B, Jin C, Wang G, Xie C, Chen S (2020) Prevalence and correlates of PTSD and depressive symptoms one month after the outbreak of the COVID-19 pandemic in a sample of home-quarantined Chinese university students. J Affective Disord 274:1–7

The University of Mississippi (n.d.) The university of Mississippi pandemic plan. Accessed from https://emergency.olemiss.edu/_files/Pandemic_Plan.pdf. Accessed 1 Mar 2021

Tohoku University (2021) Universities' preparedness and response towards multi-hazards: COVID-19, natural, and human-induced hazards. Accessed from http://aprumh.irides.tohoku.ac.jp/app-def/S-102/apru/wp-content/uploads/2021/04/Universities-Preparedness-and-Response-Towards-Multi-Hazards-COVID-19-Natural-and-Human-Induced-Hazards_0401.pdf. Accessed 31 Mar 2021

Toquero CM (2020) Challenges and opportunities for higher education amid the COVID-19 pandemic: the Philippines context. Pedag Res 5(4):em0063. https://doi.org/10.29333/pr/7947

Tria JZ (2020) The COVID-19 pandemic through the lens of education in the Philippines: the new normal. Int J Pedag Develop Lifelong Learn 1(1):ep2001

UNISDR (2015) Hyogo framework for action 2005–2015: building the resilience of nations and communities to disasters

University of Alaska (2009) Pandemic preparedness plan. Accessed from https://www.alaska.edu/risksafety/download/UA-Pandemic-Preparedness-Plan.pdf. Accessed 1 Mar 2021

University of Guelph (2019) COVID-19 pandemic plan 2019–2020. Accessed from https://police.uoguelph.ca/system/files/U%20of%20G%20COVID-19%20Pandemic%20Plan_Mar%206.pdf. Accessed 1 Mar 2021

University of Pittsburgh at Bradford (2009) Pandemic preparedness. Accessed from https://www.upb.pitt.edu/sites/default/files/files/2019-11/Pandemic-Plan_faculty-staff.pdf. Accessed 1 Mar 2021

University of South Alabama (2004) Pandemic preparedness plan. Accessed from https://www.southalabama.edu/departments/environmental/resources/usa-pandmic-preparedness-plan.pdf. Accessed 1 Mar 2021

Wang C, Cheng Z, Yue X, McAleer M (2020) Risk Management of COVID-19 by Universities in China. J Risk Financ Manag 13:36. https://doi.org/10.3390/jrfm13020036

Wang C, Zhao H (2020) The impact of COVID-19 on anxiety in Chinese university students. Front Psychol 11. Article 1168. https://doi.org/10.3389/fpsyg.2020.01168

Yang H, Bin P, He AJ (2020) Opinions from the epicenter: an online survey of university students in Wuhan amidst the COVID-19 outbreak. J Chinese Gov 5(2):234–248

Zhu X, Liu J (2020) Education in and after COVID-19: immediate responses and long-term visions. Postdigital Sci Educ 2:695–699

Part II
New Teaching and Learning Methodologies

Chapter 4
Regional Overview of Lessons from the Asia–Pacific Regions

Indrajit Pal, Anushree Pal, Kullanan Sukwanchai, and Takashi Oda

Abstract COVID-19 pandemic has affected higher education to a great extent. Educational institutes have either closed for few months or changed their session time worldwide due to the outbreak of COVID-19. The chapter explores different instructional strategies adapted in the education institutes in Asia–Pacific region. When traditional and interactive teaching and learning in physical classrooms has been hindered and restricted, it becomes a big change of both teachers and students to adapt and sustain their eagerness of learning, passion of teaching, prolonged social relationship, and confidence of unseen future. So, as long as education is still a hope for better world, maintaining its continuity through new teaching and learning methodologies adaptation is a must for developing countries. As education faced a major transformation from physical classroom teaching to virtual online learning platforms, it brought with it various challenges for both the students and teachers. Adapting to this entirely new mode of learning requires time, training, and adequate digital support. With the outbreak of COVID-19, this educational transformation had to take place very quickly. This study will explore the different methods/strategies that the educational institute followed for the quick adaptation to this new era of digital education. The study will focus on the teaching and learning methods adapted by the various educational institutions through online and hybrid systems. The study formulated different notions for online education in Asia–pacific regions.

Keywords Covid 19 · Education sector · Impact · Resilience · Student mobility

I. Pal (✉) · A. Pal
Disaster Preparedness, Mitigation, and Management, Asian Institute of Technology, Khlong Luang, Thailand
e-mail: indrajit-pal@ait.ac.th

K. Sukwanchai
Asian Institute of Technology, Khlong Luang, Thailand

T. Oda
Miyagi University of Education, Sendai, Japan

T. Izumi et al. (eds.), *Safety and Resilience of Higher Educational Institutions*,
Disaster Risk Reduction,
https://doi.org/10.1007/978-981-19-1193-4_4

4.1 Introduction: Impact of COVID-19 and Its Containment Measures on Education Sectors in Asia–Pacific Regions

On 31 December 2019, the World Health Organization (WHO) was informed of cases of pneumonia in the city Wuhan in China. It was later identified that the novel coronavirus (later named COVID-19) was the cause. Owing to the high transmission rate of infection of the virus outbreak, strict restriction measures and closure of different sectors including educational institutions was imposed by the Government of China, to control the outbreak. 13 January 2020, the first case of COVID-19 was report in Thailand. This was the first case of COVID-19 outside China (WHO 2020). By the end of January 2020, the strain of virus had been reported in 18 countries outside China. Between 31 December 2019 and 14 February 2020, COVID-19 cases were reported from 25 countries outside China (PAHO 2020). Owing to the alarming levels of spread and severity, WHO made the assessment that COVID-19 be characterized as a pandemic (WHO 2020).

The COVID-19 pandemic has adversely impacted all sectors of life with economic and education sectors being hit harder. In this chapter, we will be focusing on the unprecedented crisis caused by this pandemic in the education sectors. To mitigate the impact of the pandemic and control the spread of the virus, suspension of all face-to face teaching learning activities in educational institutes at all levels was the only way out. More than 190 countries had ordered for such closures to cope up with the COVID crisis period. The United Nations Educational, Scientific, and Cultural Organization (UNESCO) data shows that, by mid-May 2020, more than 1.2 billion students worldwide from all levels of education had stopped having face-to-face classes (ECLAC-UNESCO 2020).

The Fig. 4.1 shows the impact of COVID-19 on different areas of education.

4.1.1 Closures of Academic Institutions

Education disruption by COVID-19 came into sharp focus when millions of students were compelled to pursue studies online, with closure of campuses and institutions at all levels. As of 8 April 2020, in 175 countries globally, higher education institutions remain closed. Significant disruption of studies due to COVID-19 was observed in over 220 million post-secondary students which are almost 13% of the total number of students affected globally (ADB Report 2021). This closures of institute campuses had a snowball effect in the case of higher education institutions, jeopardizing foreign student intake in the new academic session, research, and field study being postponed, adequate research funding and jobs. International students were affected adversely, with many compelled to return to their home countries, having no clarity on when the academic year will resume. In the present scenario, the enrollment of new students into universities may pose a critical challenge. Recent reports of UNESCO highlights

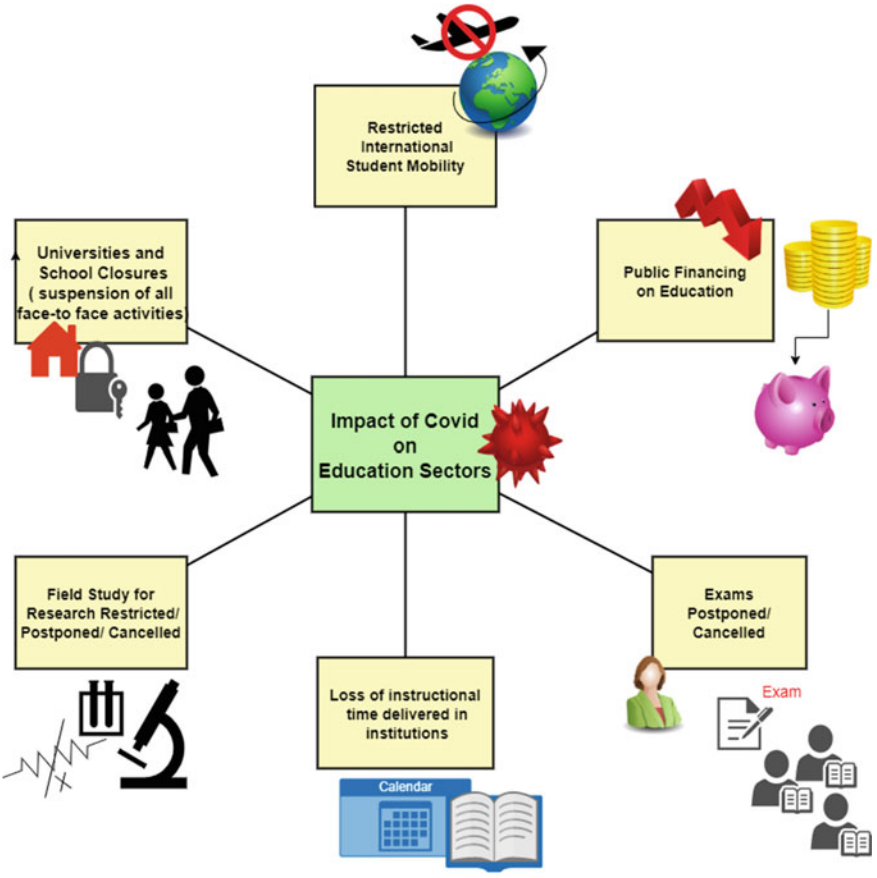


Fig. 4.1 Impact of COVID-19 on Education (authors)

that COVID-19 may adversely affect the student enrollment in the higher education (ADB Report 2021).

The responsibility to create workforce required for the economic activities and strengthening potential competitiveness of countries lies on the shoulder of the HEIs. Efficient tertiary graduates help to boost the knowledge-based economic growth and innovation. Tertiary education also prepares teachers and trainers to supports school education and TVET. Human resources for businesses sectors also rely on graduates produced by higher education. Therefore, disruption in higher education may pose serious threats to the economic growth of a country. Thus, effective strategies to sustain and strengthen higher education should be included in recovery efforts from COVID-19.

4.1.2 Student Mobility

The pandemic has also caused hindrance in student mobility and disrupted international cooperation programs. HEIs in developed countries rely on foreign student inflows significantly and are now facing crisis as these students have returned or are returning home due to COVID-19, with weak sentiments for overseas education in the coming years (ADB Report 2021).

The Institute of International Education conducted a survey and anticipated that, about 90% of US colleges and universities may see a decrease in international student enrollment, in the academic year 2020/21 (Martel 2020). A recent study conducted in April 2020 by the British Council shows that about 39% of Chinese students, as the largest source of international students in the UK, may cancel their study plans (Durnin 2020). Similarly, the Australian HEIs may see a decrease of around 150,000 Chinese students' enrollments in the coming school year (Mercado 2020).

Significant decrease in the international student mobility may take place during the COVID-19 pandemic, as students and families prioritize health and safety. Moreover the present travel restrictions and campus closures also add on to the drop in international student mobility rate. Compared to the traditional pull–push factors for international student mobility, the COVID-19 pandemic has re-ordered the factors that students consider when studying abroad. As health and safety being the primary concerns during the pandemic, the students from Mainland China and Hong Kong are considering East Asian countries and regions like Japan, Taiwan, and Hong Kong (for Mainland students) as their first choice of study destination due to the better management of the pandemic and post-pandemic crisis (Xiong et al. 2020).

4.1.3 Public Financing on Education

The COVID-19 pandemic crisis may have a long-term impact on the public spending on education as funds may be diverted to health sectors (OECD 2020) or downturns in the economic sectors may lead to readjust budgets to deal with the global economic crisis. A recent World Bank report has shown that a decline in the education budget was observed after the onset of the COVID-19 pandemic, in 65% of low- and lower middle-income countries as compared to only 33% high- and upper middle-income countries (GEMR/World Bank 2021).

The World Bank data shows that the planned hikes in 2020 investments in the education sectors are expected to be suspended in low- and middle-income countries, during the pandemic. The forecasts of the estimated public education budget allocation made prior to the pandemic situation showed, a growth in real terms in all regions and income groups (Table 4.1). However, baseline forecasts that take into account the likely impact of the pandemic estimate that spending will increase more slowly than in the pre-COVID-19 forecasts for low- and middle-income countries. If governments reprioritize their budgets and reduce the share allocated to education,

Table 4.1 Slowdown in Public Education Spending. Reprinted from World Bank Group Education; The Impact of the COVID-19 Pandemic on Education Financing; May 2020 Real growth in education spending per capita (%)

	2020 pre-COVID	2020 baseline	2020 downside	2021
High-income countries	1.3	5.4	−5.1	−2.6
Upper middle-income countries	1.9	1.8	−8.3	0.4
Lower middle-income countries	2.5	1.8	−8.4	0.8
Low-income countries	14.0	11.1	0.0	2.5
East Asia and Pacific	1.8	5.0	−5.5	0.3
Europe and Central Asia	2.0	4.3	−6.1	−1.7
LACAB	3.6	3.1	−7.2	1.2
MENA	1.9	3.8	−6.6	−2.4
South Asia	7.2	4.0	−6.4	5.3
Sub-Saharan Africa	7.7	6.5	−4.2	0.0
All countries	3.6	4.8	−5.7	−0.5

there is likely to be a downside scenario in which per capita education spending declines in almost all country income groups and regions. For example, per capita education spending in East Asia and Pacific would fall by 5.5% (World Bank Group Education 2020).

4.1.4 Impact on Student Exam

The UNESCO working document, published on 11 April 2020 on Education Sector, shows that majority of the countries worldwide decided to cancel or postpone exams. However, some countries choose to maintain the end-of-year exams, with certain measures to ensure the safety and health of students and teachers in place. Figure 4.2 shows a comprehensive summary of the Asia–Pacific Countries' stake on examination during the COVID-19 crisis period.

4.1.5 Impact on Research and Field Study

The pandemic has posed an undermining effect on the research field of higher education system, and it is anticipated that this effect will bring unprecedented and long-term implications on the research community. The research excellence of higher education institutions stands on the multidimensional and interacting pillars like (1) skilled workforce and networks, (2) necessary resources including research funding and infrastructure, and (3) multidisciplinary research culture and collaborations. Each

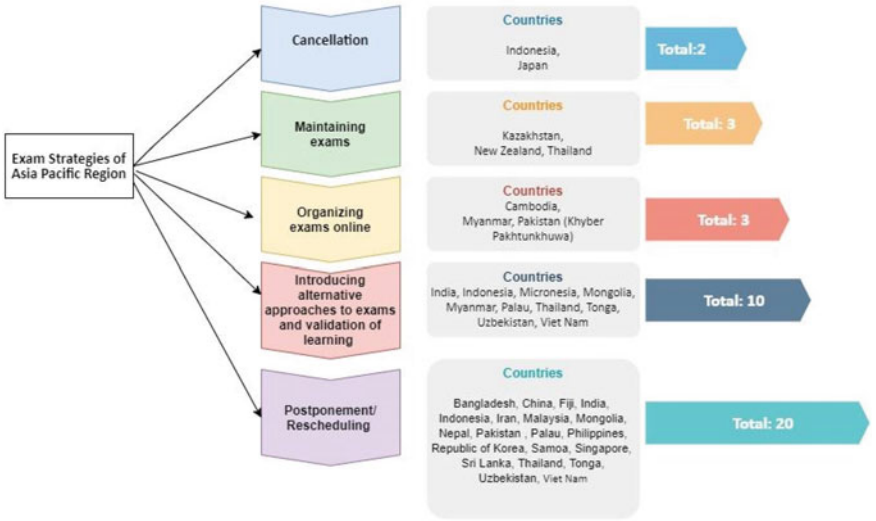


Fig. 4.2 Exam strategies of Asia–Pacific region (Modified from UNESCO working document, published on 11 April 2020 on Education Sector [Chang et al. 2020; UNESCO])

of these pillars is facing threats from the impacts of the ongoing pandemic. The research workforce is contending with finding alternative online learning resources for teaching, decreased access to laboratory space and procuring research equipment, recruiting research participants, and pausing/permanently canceled research trials/clinical trials (The Lancet 2020). Research funding is also imperiled by the economic downturns faced by the countries worldwide. Therefore, it seems that the education and training of the next generation scientists are now hanging in a balance where Universities are grappling to provide quality online education prioritizing health safety and social distancing (Fig. 4.3).

Much of scientific research work involves wet laboratory work, making it quite challenging to continue the research remotely. In comparison, dry laboratory-based computational research can be easily performed remotely in the work from home mode (Rohrig et al. 2009; Omary and Hassan 2020). A survey conducted in April 2020 by J.O. Korbel and O. Stegle showed that, 25% of life scientists had reported lost work as there was no access to laboratory due to the closure of research institutions and universities, with majority of these researches being based on wet lab (73%) as opposed to dry lab (31%) researchers. Additionally, only 10% of wet lab researchers have reported "80% productivity," in comparison with 29% of dry lab researchers (Korbel and Stegle 2020). Another survey conducted by Research Australia in May 2020, highlighted that 50% of the participants have reported inability to perform remote research. This was a major issue during the pandemic. It was also highlighted that research outcomes among basic science researchers were more likely to be affected after the year 2020, in comparison with clinical researchers (Peeters et al. 2020).

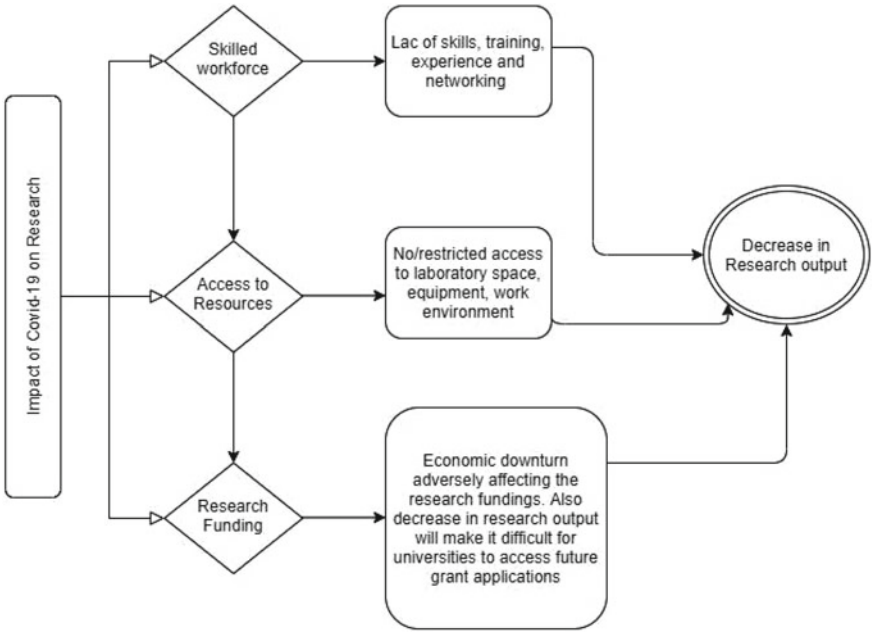


Fig. 4.3 Impact of COVID on HEIs research works

The COVID-19 crisis has also impacted scientific research that involves laboratory animals. Concern has been raised on shortage of laboratory staff due to sickness and quarantine, disruptions of the supply chain of food, veterinary drugs and the care of laboratory animals (Grimm 2020). Over a thousand mice and/or rats were similarly culled at The Max Delbrück Center for Molecular Medicine in Germany, and hundreds of transgenic fruit flies were discarded at Tsinghua University in China (Johri 2020, 24; Madhusoodanan 2020).

4.2 New Teaching and Learning Methodologies Adapted by Different Countries at the Recovery Stage of Education Disruption

As a measure to control the spread of COVID-19, educational institutions at all levels including HEIs were instructed by the government to suspend all face-to face-activities. This compelled the institutions to undergo a large-scale transition from the traditional in-person learning mode to online/digital/ distant learning mode. Some of the new teaching and learning methodologies that were introduced by the Higher Education Institutions to continue the learning process during this institute closure period were: (1) introducing massive open online courses (MOOCs) that offered free

courseware to students anytime, anywhere. (2) Foundational courses in the tertiary levels made accessible to students in the form of public good. (3) Usage of online resources by the University portals for mainstream subjects, etc. This shift of higher education system to a complete online platform of instructions brought many challenges; but it also paved the ways to innovative initiatives and strategies that are laying the foundation of the "new normal" education system.

Taylor's University of Malaysia provided virtual sites for each of its courses to allow online students' engagement such as assessments, assignments, peer support, and communication channels with peers and lecturers. Progress-tracking bars and earning digital badges kept students engaged in learning. A variety of lecture recordings and other learning materials were made available for students by a Lecture Capture System (ReWIND). Live streaming and Light Board Video Technology to record lectures were used for large-scale courses (The Star: News 2020).

Some of the universities in China effectively moved a large number of courses to the online platform within a very short lead time, for example, Zhejiang University (ZJU) has moved more than 5,000 courses to the online platform within two weeks. Creating a smart campus helped the university to readily transform from classroom-based teaching to online platform. The Zhejiang University initiated a project named "ZJU Online" since 2017 to focus aggressively on transforming administrative services, education, academic resources, information bulletins, and personal profiles online. Build smart classrooms, equipped with audio recognition and interpreting technologies enabled Zhejiang University lecturers to record video courses or live stream their classes during COVID-19 (World Education Forum 2020).

In Armenia, the national government instructed education institutions to ensure continuity of studies through remote delivery of education during the COVID-19 crisis. A new educational TV channel called Hybrid Edu had been introduced combining online, remote, distance, and digital learning modes through. The Hybrid Edu channel uses Zoom, Moodle, Blackboard, Google Hangouts, and WhatsApp, including integrating materials from massive open online courses via Coursera (Gharibyan 2020).

4.3 A Comparative Study of Traditional and New Teaching and Learning Methodologies: Advantages and Disadvantages

COVID-19 has opened ways of various alternative teaching and learning methodologies to cope up with the crisis in the education sector. Assessing the advantages and disadvantages of these methodologies critically and comparing it with the traditional in-person teaching learning method will help us understand the future pathway of education system (Table 4.2).

Table 4.2 A Comparative overview of traditional and new teaching and learning methodologies

	In-person teaching learning method	Online teaching learning method
Instruction/lecture	Real-time face-to-face teaching and learning in Universities	Virtual teaching and learning through various online platforms like Google Meet, Zoom, Pre-recorded videos uploaded in the university portals
Lab-based education	All wet lab and dry lab-based research work can be conducted with ease and effectively	Dry lab-based research can be carried out online. Wet lab-based researches were postponed, canceled due to decrease in access to laboratory space and equipment. A decrease in research outcomes was noticed during the pandemic
Examination	Both Summative and Formative examinations conducted	New alternatives were opted for examinations. Online examination platforms were introduced by some HEIs. Reducing number of examinations or considering project assignments to evaluate students were other alternatives
Duration of teaching learning period	Normal/traditional timetable formats were followed with time bound instructions and learning activities	Teaching–learning time period was compromised owing to other influencing factors like availability of internet and digital devices
Infrastructure and facilities and learning environment	University facilities and infrastructures provided an ideal environment for teaching and learning	University infrastructure and facilities could not be accessed due to institute closures. Students and teachers had to depend on online resources, dry lab, virtual labs for teaching and learning. However, wet lab-based studies and researches faced extreme challenges to continue in the online mode

(continued)

Table 4.2 (continued)

	In-person teaching learning method	Online teaching learning method
Networking and student exposure	Workshops, conferences, and symposium (local as well as international) organized by universities, various student exchange programs, internship programs gave the students a good exposure and experience on the job markets	Virtual Workshops, conferences, and symposium (local as well as international) organized by universities on the online platforms. This helped in building networking, however, travel restrictions suspended student motilities (student exchange program/internship program)

4.4 Future Trends of Teaching and Learning Methodologies: A More Resilient Education Sector

A number of international agencies, including UNESCO, United Nations Children's Fund (UNICEF), Organization for Economic Co-operation and Development (OECD), International Labor Organization (ILO), and World Bank, have analyzed the impact of COVID-19 and suggested necessary policy responses, with a strong focus on new approaches to teaching and learning during institute closure (ADB, January 2021).

As governments and other stakeholders adopt measures to fight the pandemic and ensure continuity of teaching and learning during institute closure, the emergence of a "new normal" seems to dominate discussions. This stems primarily from the premise that even after COVID-19, education systems will need to maintain measures that will be introduced and become part of the new operating procedures, and that these alternative mechanisms could potentially help to address specific needs of students.

The Asian Development Bank, Manila, has discussed the following key principles in their report "Covid-19 and Education in Asia and Pacific: Guidance Note" published in January 2021, that would contribute in shaping up a more resilient education sectors in future:

4.4.1 Transformational Potential of Education Technology

The transformation from traditional methods of teaching to digital platforms of instructions was the key to respond to education disruptions caused by the COVID-19 crisis. There is no doubt that digital platforms and associated solutions having great potentials on education continuity during the crisis irrespective of COVID-19 pandemic. Technological solutions for education having three promising areas: (i) encourage personalized and adaptive learning as potential student learning outcomes,

(ii) improvement of teachers' capacity to support and monitor student learning, and (iii) improving accountability of education systems by linking education delivery with learning data. The digital solutions can be implemented across various levels of education, e.g., K-12 school education, higher education, and vocational education. It is important to focus five interrelated areas: (i) identifying critical policy reforms; (ii) improving access to internet connectivity for education and training institutions, and households through additional investments; (iii) restructuring the professional development program for teachers and students to improve the technological and digital skills; (iv) develop mechanism to support parents and students to continue learning in the institutions and at home; and (v) explore the options for public–private partnerships to encourage more investments to mainstream digital education widely.

4.4.2 Linking Short-Term Measures with Long-Term Reforms

It is important to take immediate measures to ensure learning continuity through the development of long-term framework to improve learning quality. Poor learning quality was also evident prior to the COVID-19; therefore, there is a need to mitigate learning obstacles to raise the quality of learning. Digital platform could play an important role to bridge the teaching and learning through the online and distance learning strategies introduced during COVID-19. It is necessary to look into the long-term planning to facilitate hybrid learning (face-to-face and virtual) and strengthen teacher for efficient management of student learning.

4.4.3 Placing Education Technology Solutions in a Holistic Framework

Inevitably the impacts of COVID-19 pandemic have widened the gap of existing inequalities in education system and at the same time also highlighted new opportunities of home learning. The transformative changes in the learning process generated awareness about the teaching and learning outside physical set up of the educational institutions. Multi-stakeholder engagement through a holistic framework is required consideration of different pillars: (i) dynamic government policies considering emerging priorities on formative assessment and monitoring to ensure learning progress; (ii) improvement of telecom infrastructure for reliable, affordable, and stable connectivity in partnership with telecommunication companies; (iii) encourage readiness for school, teachers, and staffs to cope up with the new ways of learning practices; (iv) mechanism to support parents and students for personalized learning

outside of school premises to minimize the inequalities in learning opportunities; and (v) enhance partnerships with the companies developing and proving digital content, and support adaptive learning platforms to ensure effective delivery mechanisms.

4.4.4 Investing in Capacity Building to Optimize Education Technology Solutions

Transformative changes from in-person class teaching to online learning during the COVID-19 crisis have unearthed significant gaps in capacity among teachers and education administrators in managing alternatives ways of teaching and learning. There is a serious requirement to collaborate institutions responsible for curriculum development, assessment, professional development of the teacher with the universities and also invite talents from the public and private sectors to help transforming teaching and learning. Improving capacity of the stakeholders of education system is the key for successful transformative role of technology.

4.4.5 Mobilizing Support to Education Sustainable Development Goals

It is important to protect the government investments for the education sector during the economic downturns amid COVID-19 crisis. Keeping in mind the short-term urgency to prioritize budget allocations to health and economic recovery activities, there is possibility of budget cuts for education sectors. However, budget cuts for education sector will have long-term negative consequences in terms of adverse impacts to human capital development and societal well-being. It is crucial to invest in the education sector to support meet the Sustainable Development Goals. Infrastructure to the strengthen the internet connectivity for education and training needs more investment for wider benefits across sectors and the overall economy and also create new opportunities for self-directed and lifelong learning for students and teachers.

4.5 Discussion and Conclusion

Significant disruption of studies due to COVID-19 in the Higher Education Institute was evident through our research findings. During the COVID-19 pandemic transition to online learning surfaced significant gaps in capacity among teachers and education administrators in managing the new alternative ways of teaching to physical or in-person education system. There is a need to plan for the online and distance learning

strategies introduced during COVID-19 which could help in bridging the teaching and learning gap. Mitigating learning obstacles certainly raise the quality of learning at various levels of education system as well as economies. Policymakers need to prioritizing budget for the education sector resilience for multiple hazards in the agenda for long-term planning to pave new ways of facilitating blended learning (face-to-face and virtual). As the governments and education institutions adopt measures to fight the pandemic and ensure continuity of teaching and learning during institute closure, the emergence of a "new normal" necessitates linkages between short-term measures and long-term efforts.

Acknowledgements This paper reflects the research outcome of the multi-institutional project titled "*Disaster Education for Integrating SFDRR and SDG in Asia*" supported by ProSPER.Net UNU-IAS, Japan. We are also thankful to our project consortium partners for their support in project execution.

References

ADB (2021) Covid-19 and education in Asia and Pacific guidance note. © 2021 Asian Development Bank, Manila, January 2021. ISBN 978-92-9262-579-5 (print). 978-92-9262-580-1 (electronic); 978-92-9262-581-8 (ebook). https://doi.org/10.22617/TIM200397

Chang G-C et al (2020) UNESCO. COVID-19: A glance of national coping strategies on highstakes examinations and assessments. https://en.unesco.org/sites/default/files/unesco_review_of_high-stakes_exams_and_assessments_during_covid-19_en.pdf

Covid-19 Report, ECLAC-UNESCO; August 2020

Durnin M (2020) Covid-19 update: China survey results. British Council, London. https://education-services.britishcouncil.org/insights-blog/covid-19-update-chinasurvey-results?_ga=2.183165667.436377671.1596516253-1764238916.1596516253

GEMR/World Bank (2021) Education finance watch 2021. UNESCO and The World Bank, Paris/Washington, DC

Gharibyan TL (2020) How COVID-19 is sending Armenian education online. European Association for International Education. 26 May. www.eaie.org/blog/COVID-19-online-education-armenia.html

Grimm D (2020) Respirators, quarantines, and worst-case scenarios: lab animal facilities grapple with the pandemic. Science

Johri N (2020) How lab animals have fared in the coronavirus crisis. https://www.dw.com/en/how-lab-animals-have-fared-in-the-coronavirus-crisis/a-54002319

Korbel JO, Stegle O (2020) Effects of the COVID-19 pandemic on life scientists. Genome Biol 21(1):113

Madhusoodanan J (2020) Frozen cells and empty cages: researchers struggle to revive stalled experiments after the lockdown. Nature

Martel M (2020) COVID-19 effects on U.S. higher education campus: From emergency response to planning for future student mobility. Institute of International Education, Washington, DC. https://www.iie.org/en/Research-andInsights/Publications/COVID-19-Effects-on-US-Higher-Education-Campuses-Report2

Mercado S (2020) International student mobility and the impact of the pandemic. BizEd: AACSB International. 11 June 2020. https://bized.aacsb.edu/articles/2020/june/covid-19-and-the-future-of-internationalstudent-mobility

OECD (2020) THE impact of Covid-19 on education—insights from education at a glance 2020

Omary MB, Hassan M (2020) Opinion: here's how we restore productivity and vigor to the biomedical research workforce in the midst of COVID-19. Proc Natl Acad Sci USA 117(33):19612–19614

PAHO. 14 February 2020. https://reliefweb.int/sites/reliefweb.int/files/resources/2020-feb-14-phe-epi-update-covid19.pdf

Peeters A, Mullins G, Becker D, Orellana L, Livingston P (2020) COVID-19's impact on Australia's health research workforce. Lancet 396(10249):461

Rohrig B, du Prel JB, Wachtlin D, Blettner M (2009) Types of study in medical research: part 3 of a series on evaluation of scientific publications. Dtsch Arztebl Int 106(15):262–268

The Lancet (2020) Vol 396. 29 August 2020. www.thelancet.com

The Star: News. Sunday 29 March 2020. https://www.thestar.com.my/news/education/2020/03/29/learning-mustnt-stop-with-covid-19

WHO (2020) 13 January 2020. https://www.who.int/news/item/27-04-2020-who-timeline---covid-19

World Bank Group Education (2020) World Bank Group Education; The impact of the Covid-19 pandemic on education financing, May 2020

World Education Forum (2020). 16 March 2020. https://www.weforum.org/agenda/2020/03/coronaviruschina-the-challenges-of-online-learning-for-universities/

Xiong W, Mok KH, Ke G, Cheung JOW (2020) Impact of Covid-19 pandemic on international higher education and student mobility: Student perspectives from Mainland China and Hong Kong, September 2020

Chapter 5
The COVID-19 Pandemic and the Higher Education Sector in Africa: A Tragedy for an Awareness of the Sector's Resilience

Mahefasoa Randrianalijaona, Julien Salava, Thierry Razanakoto, Holy Randriamanampisoa, and Pierre Lazamanana

Abstract Despite of enormous efforts since independence to alleviate poverty and improve its people's quality of life, the African continent continues to face frequent political unrest and has low to moderate economic growth rate, with the exception of few countries now classified as emerging states. For decades, the economic growth of the African continent has been widely dominated by private consumption. Lately, there is a shift and investment becomes now the main contributing sector and human capital is expected to play an important role. In Africa, the contribution of the HEIs sector to the economic growth of the continent is relatively modest and, most of the time, not counted or under-estimated. Because of the very limited capacity of countries, HEIs sector has not given its due importance and is receiving a meaningless part of national budgets. This poor funding allocated to the HEIs sector is considered by many as a proof of how the sector is badly perceived by governments in the continent. The lack of or insufficient funding to the sector impacts negatively its capacity to be competitive and also the capability of its actors to properly play their role, especially in terms of research and academic activities. The shock caused by the COVID-19 pandemic was too important for the sector. Universities were closed and the lockdown lasts for many months during which no activity was performed. The very limited resources they are allocated to were not sufficient even to mitigate partly the impact of the pandemic to the sector. In many countries, distance learning was not possible because most students and teachers were not provided with relevant materials and equipment. Offices were closed and universities administration

M. Randrianalijaona (✉) · J. Salava · T. Razanakoto · H. Randriamanampisoa · P. Lazamanana
Development Centre for Economic Studies and Research (CERED), University of Antananarivo, Antananarivo, Madagascar
e-mail: randrianalijaona@gmail.com

Multidisciplinary Department On Disaster and Risk Management (DMGRC), University of Antananarivo, Antananarivo, Madagascar

Partners Enhancing Resilience for People Exposed to Risks—Universities (PERIPERI U), University of Antananarivo, Antananarivo, Madagascar

Unité Mixte Internationale—SOURCE (UMI-SOURCE), Guyancourt, France

T. Izumi et al. (eds.), *Safety and Resilience of Higher Educational Institutions*,
Disaster Risk Reduction,
https://doi.org/10.1007/978-981-19-1193-4_5

could not operate from the campus. Internet infrastructure exists but was limited to cover only some places of the campus. In many cases, it became clear that business continuity plans were not in place. The impact of this COVID-19 pandemic is so important, and HEIs sector actors are now wondering if this tragedy could be the starting point of government awareness for HEIs' resilience building.

Keywords COVID-19 · Africa · Resilience · HEIs · Disaster risk management

5.1 Introduction

Since independence, African countries have made great efforts to significantly alleviate poverty and to catch up with the development lag they have encountered during colonization. The main objective was to improve the living standard of their populations. Unfortunately, the continent is also sadly known as one of the continents with relentless and almost cyclical crises for decades (Véron 2010; Ong'ayo 2008). More than fifty years later, weak institutions of the state, flawed legislative systems, and constant struggles for political power are defining the continent and were seen as major factors—among others such as lack of infrastructure, Western economies dependence, etc.—contributing to development policy failure and exacerbating the well-being of many nations.

Economic poverty has a definite impact and severely limits investment capacity of nations. Education, which is one of the most affected areas by colonization, is among those suffering from a lack of investment. The failure was particularly significant both in terms of infrastructure, which suffered greatly in numbers and quality, and at the level of the teaching staff. Higher education institutions (HEIs) are no exception in the general education sector. Indeed, the development policies chosen by most of African countries do not seem to give the right importance to HEIs. This weakens the system as a whole and makes it vulnerable to different types of shocks. The COVID-19 pandemic, which has affected the entire world, has undermined virtually every sector and area, even if the consequences are not the same for all sectors. Higher education is not spared from the shock of the pandemic and has experienced a number of disruptions that affect both education and research.

By trying to provide an analysis of the disruptions caused by the COVID-19, this chapter attempts to develop critical insights into how the sector has been affected at the African continent level and also how it has responded to the situation. The analysis will then focus on lessons to be learned that are needed to have more information on the higher education sector adaptation capacity in Africa and their resilience. To this end, the chapter will be built mainly around two axes: first, a description of the higher education sector in the continent and, second, an analysis of the impact of the COVID-19 pandemic on HEIs in Africa.

5.2 Higher Education Sector in Africa

The higher education sector is considered by many as key sector for societal growth (Adriansen et al. 2016), particularly through its role as knowledge creator and transmitter (Marginson 2010; Ogbodo et al. 2013), through capacity building of the population, especially the labor force. Therefore, its performance is essential and decisive to ensure a good level of country's human capital. In the higher education sector, capacity building is generally carried out in two ways: education and research. Often, the first is used to convey knowledge in order to help the learner to have more skill to use to do better his job and master it, which is a very important condition for good work performance. Defined as «the skills and knowledge of human being», human capital at an acceptable level or even high level can contribute greatly to the creation and growth of country's wealth (Boztosun et al. 2016). Education is thus considered a major factor in the creation of human capital (Randrianalijaona and Holloway 2015). Over time, the accumulation of wealth produced can have very positive impacts on development (Abbas and Mujahid-Mukhtar 2000). In this section, we will see three main points successively. The first will focus on a brief overview of Africa's economy to have a better understanding of the African context. Then, the question of the place of the higher education sector in development policies will be addressed. Finally, the third sub-section will discuss the description of the higher education sector in the continent.

5.2.1 Brief Description of African Economy

Often considered underdeveloped, the economies of African countries, with the exception of a few such as those of South Africa, Nigeria, Angola as examples, are heavily dominated by the primary sector. Indeed, the sector employs more than 60% of the continent's workforce, while its contribution to national wealth is relatively small compared to the number of labor this sector is employing. It can vary greatly from country to country, ranging from 2% (Libya, Botswana) to more than 40% of GDP (Chad, Somalia, etc.) with an average of 20.91% for the whole continent (Atlasocio.com 2019).[1] Agriculture is therefore the main economic activity of the continent in general and characterizes the economy. However, despite this place, it still enjoys very few modern cultural techniques, with very low mechanization which is difficult due to the very limited size of parcels occupied and cultivated not exceeding one hectare per family on average. From this point of view, large-scale investment in the form of professional concessions remains difficult. The possibility of expanding the land to be cultivated is also made difficult by the existing land

[1] Available at https://atlasocio.com/classements/economie/secteurs-activite/classement-etats-par-secteur-primaire-en-pourcentage-du-pib-afrique.php. Accessed 10 May 2021.

tenure, which remains heavily influenced by the colonial era and not adapted to the real needs of the peasant populations. In this context, mobilization and access to capital to invest and modernize the sector is highly compromised and remains very limited. Improving productivity and increasing agricultural production in a scale that can adequately feed an ever-increasing population, often requires techniques based on the choice of improved seed varieties combined with chemical fertilizers and pesticides. However, considered unsustainable, they are the source of environmental concerns and will therefore be abandoned over time. In addition, infrastructure is generally lacking, particularly the access roads connecting different regions within a country, which condemns many areas making them inaccessible or difficult to reach, especially during rainy seasons. This makes it even more difficult to develop agricultural activities and further increases the difficulty for the rural world to move out of the state of the local economy dominated by subsistence agriculture.

The rural world still dominates the continent, and the education levels remain relatively low for the large number. Big efforts were made to combat illiteracy among most African countries in the first half of the post-colonial era. Although these efforts have been successful, it is noted that, in general, the level of education is still low. This has led most countries to opt for an education policy and strategy for all in order to raise the literacy level and thus improve the quality of the continent's abundant workforce. However, it must be recognized that the vast majority of the population in African countries have a level of education that does not exceed the secondary level. In Madagascar, for example, the rural population representing more than 75% of the total population generally has a level of education below secondary. Thus, only a fringe of the middle-class population has access to higher education and will form the elite class.

However, since the second half of the 2000's, improvements in the economies of some states (e.g., Angola, Ghana, Nigeria, North African countries) have been observed, thanks in particular to a certain political stability that was lacking during the first three decades of the post-colonial era, on the one hand, and also to greater investments on the other. Imposed by globalization, foreign capital through foreign direct investments (FDI) facilitated by a more open economy has arrived on the continent seeking more profitable opportunities than in the Western countries. This policy openness was also supported by bilateral and multilateral donors, who later became technical and financial partners. As a result, the composition of national wealth is beginning to become more diverse. While the primary sector still holds a large share, private consumption boosted by the income received from FDI-created jobs is also starting to occupy a significant place.

Despite all this, the question of the place of the higher education sector and its role in the national economy remains relevant.

5.2.2 *Place of African Higher Education Sector in Development Policy*

Generally speaking, higher education institutions (HEIs) have played various roles and responsibilities over time which have been shaped by socioeconomic contexts and political dynamics of nations and societies (Clark 1983). In this sense, the sector is considered to be a particularly important tool that can significantly improve the level of human capital and the quality of a country's workforce and also, through the results of research, strengthen the use and ownership of new technologies and innovations. These conditions are essential for any country's development. Higher education is therefore a very powerful weapon and means to introduce change in societies (as stated by Nelson Mandela) and support sustainable development efforts, especially for the African continent at all levels. For Africa, it's clear that making effective and efficient use of its human and abundant natural resources requires a quality and dynamic higher education capable to provide its citizens with the requisite skills and knowledge. However, ensuring a quality higher education in the continent calls for massive financial investments which would be possible only if governments recognize its importance and value the sector accordingly by putting it at the top of their priorities and channeling the right amount of funding to it, despite of the very competitive context and limited financial resources countries may be facing (Cooper-Knock 2015).

Higher education is the pivot of research and innovation of every growing economy. Problem-oriented research facilitates economic growth because it provides the basis for industrialization and sustainable development. Africa is endowed with large quantities of untapped natural resources that should spearhead its development. These resources cannot be effectively maximized without proper investment in higher education and quality research; in other words, "*Higher education sector is the key to unlock sustainable development in Africa*" (ADEA 2018) and universities were expected to be key contributors to the continent human resource needs by providing, in particular, quality human resources for the civil service and the public professions (Muller et al. 2017).

As mentioned above, the African continent faces a major constraint of lack of financial resources despite the existence of significant natural resources, including mining, environmental, and forestry. The limited internal own resources that exist are practically and systematically complemented by external funding in the form of grants and credits to be able to meet some of the needs of countries. Investment capacity is not only very limited but also conditioned by external sources of funding. In education, two key points have to be addressed. First, the fact that, compared to other sectors, the higher education and research sector is not among the priorities of governments and is relegated to second place. Although it is not possible to have annual budgets for countries at this stage, the fact that the protocol ranks of the various ministerial departments show the importance given to them and which also determines the budget allocation for each department. The ministerial department in charge of higher education and scientific research is rarely among the top ten or even

more. There is therefore a quite strong contradiction here between the rhetoric that claims to want to put the sector at the forefront of the development of countries and the reality that shows the complete opposite. Secondly, with regard to the limited budget allocated to the education sector, a significant proportion is often directed to primary and secondary education at the expense of higher education and research (Cooper-Knock 2015).

The example of Madagascar in this regard is more than revealing. Indeed, the importance given to each level is very different even if staffing needs are all very high. In 2020, the State budget in the country's original Finance Law showed the opening of new budget posts for the recruitment of teachers: 7,000 posts for primary and secondary schools, 500 posts for technical education, and 100 posts for higher education and scientific research. In other words, it has been allocated to higher education the equivalent of one-seventieth of the primary and secondary education budget posts. Apart from the nine national research centers, which are also under the supervision of the Ministerial department for higher education and scientific research, these 100 budget posts would be distributed among 6 public universities of the country, composed of 54 faculties, schools, and institutes. Equally shared, universities would be able to recruit each 1.9 persons (1 lecturer and 0.9 administrative and technical staff). Moreover, these 100 budget posts which may seem a lot at first sight are not enough even just for net replacement of lecturers in this sector for the same year. Indeed, the actual number of job losses for 2020 is 117 posts composed of dead and retired teachers. It is therefore a position that does not even support the teacher-student ratio, increasing the quality of teaching and research in the sector is a real challenge.

Unless significant investment increase to keep pace with growing enrollment numbers, African universities will continue to be severely stretched. At present, the average number of students per lecturer in sub-Saharan Africa is twice as high as the international average. In Kenya, studies recorded up to 64 students per lecturer whereas it goes up 150 students per lecturer in Madagascar. Many African lecturers are continuing to be overstretched and teaching large class sizes. Currently, investment in African universities is lacking, and the quality of education is suffering as a result. In 2015, African governments investment in HEIs was estimated to be around US$2,000 of public funding per student. This is more than the average for developing countries, but widely insufficient to complete the decades of underinvestment (Cooper-Knock 2015).

5.2.3 Context of HEIs Sector in African Continent

After independence, African countries inherited fragile institutions which did not have social legitimacy from the public as very few households were able to access universities. This sector was highly underdeveloped under colonialism (Muller et al. 2017). The donor-client dependency relationship had inhibited the development of African institutions and the capacity of Africans to develop educational policies

which are socially relevant and financially feasible. The impact of this situation will be developed below.

For the past two decades, HEIs in Africa have accounted a tremendous student enrollment increase. The number of students enrolled in tertiary education has increased from fewer than 200,000 in 1970 to around 10 million forty-five years later (Cooper-Knock 2015), that means 50 times higher with an annual increase rate of 109%. Such an increase, coupled with financial constraint, is making the task of having a quality education more challenging than ever. If globally, higher education is undergoing massive transformation and development, in Africa, to benefit from such changes, higher education sector needs to build capacity of universities to pursue quality education and innovative research based on countries' needs.

Unfortunately, in Africa, the lack of investment is a real issue for the sector and increases the number of challenges it faces. The issue of infrastructure and appropriate equipment to accompany them is the first one. The lack of investment over several decades has not improved the state of infrastructure in both number and quality. These are infrastructures including classrooms, to accommodate students who are continuing to grow as a result of the democratization of primary and secondary education, as well as those related to research activities. Not only is the number very limited, but the materials used to equip them are in part out of date and do not allow African HEIs to be as competitive as required by the environment in which the sector is currently located. In terms of IT, for example, buildings are under-equipped and only campus central offices are partially equipped. This is also the case for lecturers and students. They often use their personal Internet connection for the teaching and research need. This is not a surprise, especially given that the results of a survey conducted in 30 countries on the continent clearly lead to a very negative observation. Indeed, the use of broadband Internet on the continent affects an average of 2.05% of the population. This figure hides the reality because contexts vary widely in most countries; only 3 out of the 30 (10%) countries surveyed have utilization rates of this average. However, if Mauritius and Seychelles are excluded, with, respectively, 20.3 and 21.6% utilization rate, this average is at a particularly low level of 0.7% of the African population.

The first consequence of this is the way lectures are delivered. The method of teaching in the classroom largely dominates the ways lectures are delivered to students. On the other hand, because of the limited available research budget, research activities are almost non-existent. As a result, faculty researchers are forced to partner with foreign research and funding agencies in order to conduct research. Such a situation is not without drawbacks. Indeed, the funded research themes may not always be aligned with the country's real needs and priorities, but rather more responsive to the concerns of research funding agencies. One of the major consequences of this mode of research funding is that the results obtained may not remain in African countries where the research was carried out, but may leave with and go to the funding agencies countries.

At global level, the current tertiary enrollment is around 32%, in Africa the average rate of 12% hide very diverse realities, rates range from 2% (Niger) to 33% (Egypt) whereas South Africa and Nigeria stand, respectively, at 20% and 14%.

This section developed a summary of the prevailing situation in African HEIs which gave information allowing to have a better understanding of the sector, from development policy perspective of the role HEIs are expected to play as well as the current state this sector is operating. It's clear that the lack of investment policy highlighting the poor consideration of the sector by governments is the main source of African HEIs problems and challenges. A good understanding of the sector will be very useful to analyze the impact of COVID-19 pandemic on higher education and research in the African context that the following section will be developing.

5.3 African HEIs and the COVID-19 Pandemic

The COVID-19 pandemic which began in China in December 2019 has caused significant global disruptions, both in human terms, with millions of deaths (6.9 million as of 7 May 2021 globally according to the IHME), and in economic and social terms. Compared to other parts of the world, the African continent was reached quite late, around the middle of February 2020. However, the social and economic impact is still significant, although the number of deaths is among the lowest to date. This section is aimed at providing more insight on how African HES was affected by the COVID-19 pandemic and the what response strategy has been chosen to cope with. The section starts with a brief description of the current situation in Africa and then describes how the COVID-19 pandemic affected the continent.

5.3.1 Brief Description of the Pandemic in Africa

The coronavirus first hit African soil on February 14, 2020, in Egypt after an imported case. And since then, the global pandemic has spread and affected almost all African countries. Contrary to what happened in other parts of the world, the rate of contamination was particularly low. Whereas other continents had daily numbers of contamination by hundreds of thousands and deaths by tens of thousands, especially during the first wave, in the African continent, the numbers are quite low with contamination and deaths by tens of thousands and by thousands, respectively. Reports at the country level, although deaths are always painful, the average number of deaths per day is fairly "positive and encouraging" because it rarely exceeds 10 deaths per day. Indeed, during the period from 7 April to December 30, 2020, a 267-day observation period and for a cumulative total contamination of 2,728,602 across the continent, the official figures published showed that the number of 10 deaths per day was only

16 times[2] higher, which means that the death figures exceeded 10 deaths per day only 16 days out of 267.

If this is the case from a health point of view, the economic and social consequences are completely different. As a result of the various restrictions and barriers measures to control the spread of the COVID-19 pandemic and the contamination of the population, most economic activities are slowed down or even stopped in some cases. In general, all sectors are facing this situation, both the productive sectors (primary and secondary) and the service sector, in rural and urban areas, even if the level of disruption is not the same. Indeed, economic activities heavily dependent on external relations are the most affected by the closure of borders. This is particularly the case of tourism industry. The impacts are felt at the individual, household, and national levels. For example, at the level of the individual, the loss of employment and thus the increase in the unemployment rate is one of the direct consequences; at the household level, we are talking about the decline in purchasing power, which will have impacts such as the decrease in demand, among other things, affecting negatively the level of enterprises sales. The governments' own resources, which are mainly financed by taxes paid by taxpayers (individuals and companies), are also negatively affected. This will result in a reduction in the capacity of the State to fulfill its responsibilities. The magnitude of the consequences will be all the more important as the social dimension will also be affected by the State's inability to meet investment needs in this area. One of the sectors that will be most affected is education.

From the HEIs perspective, the risk of to be affected twice is quite high: the could be hit upstream by the COVID-19 pandemic and downstream by the lack of means of State resources to meet the necessary new investment costs required due to the disruption caused by the COVID-19 pandemic.

5.3.2 Impacts of COVID-19 on HEIs Sector

5.3.2.1 Description Méthodologique

In the context of this study, which focuses on the impact of the COVID-19 pandemic on the higher education and scientific research sector in Africa, the period considered is that which coincides with the first wave of the pandemic in the continent and the few months before the arrival of the second wave (February 2020 to February 2021). Using a questionnaire designed after the literature review on the topic subject, the study, which is essentially qualitative, was conducted at seven African universities in

[2] Based on statistics published by Africa cdc/African Union. For further detailed information, please visit https://www.coronavirus-statistiques.com/stats-continent/coronavirus-nombre-de-cas-afrique/ and https://africacdc.org/covid-19/.

Table 5.1 Number of students per university and per faculty

University	ABU	AU	BDU	UA	UDM	UGB	USTHB
Students (S)	–	–	52,830	35,000	2,500	12,108	40,000
Faculty (F)	–	–	19	10	3	9	8
Ratio S/F	–	–	2,781	3,500	833	1,345	5,000

Source Authors

seven countries.[3] Thus, the objective is not to have representative results but rather a better understanding of the consequences of the pandemic. Findings will be analyzed with information drawn from other sources.

5.3.2.2 Results and Analysis

With the exception of the Technical University of Mozambique, the studied universities are from public sector. Like all the universities of the continent, they all have been greatly affected by the COVID-19 pandemic. The results and analyzes will focus on three main themes: university administration, teaching, and research.

Impact of COVID-19 on University Administration

The size of the universities studied varies greatly. In terms of student numbers, the numbers range from 2,500 for 3 faculties to about 52,800 for 19 faculties. As shown by Table 5.1, apart from UDM, the minimum number is 12,108 students, showing the high number of public university enrollments at the level of the continent with an average of 34,985 students per university.

At the faculty level, which also includes institutes, schools, and academies, as in the case of BDU, the number of students per faculty remains equally high, ranging from 800 to 5,000 with an average of 3,157 students per faculty. Despite this wide variation, the impact of the pandemic during the first wave remains broadly the same regardless of the size of the university. Indeed, all universities were closed by security measures for the university population, including administrative staff who run the university administration. The measures taken are actually aimed at a dual objective. The first concerns the prevention of contamination of administrative staff from home to the university via public transport, as it is the mode of transport most used by them. And the second objective is to prevent contact contamination in workplaces,

[3] Algeria: Université Sciences et Technologie Houari Boumediene (USTHB); Ethiopia: Bahir Dar University (BDU); Tanzania: Ardhi University (AU); Senegal: Université Gaston Berger (UBG); Madagascar: Université d'Antananarivo (UA); Mozambique: Technical University of Mozambique (UDM) which is a private one and Nigeria: Ahmadu Bello University (ABU). We extend our sincere thanks to the PERIPERI U program managers of these Universities for their collaboration and support.

that is, campuses. In some cases, in urgent cases, exceptionally, administrative staff could come on-site but at very limited numbers and organized alternately to limit contact, since teleworking could not be widely practiced, or at least very limited, because of the lack of infrastructure and means available for staff. This is the case, for example, of Ardhi University. All this shows that universities are no longer able to operate normally and administrative activities were practically stopped. The direct consequence of this situation is the automatic closure of universities, because administrative and technical staff are essential for universities to be able to normally operate.

COVID-19 Pandemic Impact on Research

As explained above, research is among the sectors of higher education and scientific research most affected by the lack or non-existence of investment by African governments over time. The few research activities that are carried out are in most cases, financed from outside sources (direct funding from donors or foundations, collaboration with foreign universities, etc.). There are two main categories of research in relation to the actors who perform and undertake them: the research carried out by lecturers themselves and by students under the supervision of the lecturers, as part of their courses for graduation. These activities can be performed either on campus, such as laboratory experimentation, or in the field outside the university. Both cases are affected by the COVID-19 pandemic, and research on the university's own campus can no longer be undertaken after the university closes in order to limit contamination by contact between people. Similarly, for off-campus research activities, they can no longer be done because containment measures strongly prohibit and restrict exit from home. On the other hand, for the partial containment measures introduced in almost all countries at different periods, depending on the number of contaminated cases per country, the limitation of exit outside administrative zones of residence (commune, district, etc.) was applied. As a result, it was not possible to carry out the research activities of students at the end of their studies.

In other words, whatever the type of research, the measures taken by the authorities for the safety and health of the population against the pandemic had a definite impact on them. One of the direct consequences is the delay in research programs or projects in relation to the planning established before the COVID-19 pandemic. There is also the delay experienced by students in finalizing their studies or in moving to higher levels requiring research, particularly those who have already completed theoretical or practical courses but have therefore not been able to graduate or access upper level class.

COVID-19 Impact on Teaching

For the African continent, teaching appears to be the main branch of higher education and scientific research sector, owing to its responsibility and mission to fill the gaps

Table 5.2 University lockdown duration per university

University	ABU	AU	BDU	UA	UDM	UGB	USTHB
Lockdown (month)	10	2.5	9	6	9	6.5	12

Source Authors

in the skilled workforce and to train the continent's elites to fight poverty. In the absence of adequate infrastructure in quality and number, the main cause of which is the lack of investment in the sector by governments, public universities have always been under pressure. This situation is all the more visible because lessons and courses are almost exclusively delivered in classroom mode. According to the results of our study, more than 95% of the courses and lectures are held in the classroom in face mode for all universities involved in the study.

On the other hand, universities' functioning is entirely supported by state-provided subsidies for both staff, research when available, and teaching. In general, state subsidies for higher education and research are partitioned into tranches and the most important ones (at least 50% of subsidies) still arrive by the fourth quarter of the year, after the pandemic has already affected the sector. This also partly explains the difficulty that public universities face in responding to the pandemic, because not only are the resources not sufficient, but also their late arrival leaves universities without the needed capacity to adequately prepare, respond to the shock and the adaptation capacity required to deal with it. Moreover, virtually all universities surveyed responded that they do not have business continuity plans, although some (93.3%) claim that they have a contingency plan designed for the country's major risks but that was inadequate and thus unusable during the pandemic.

All these factors have made the most accessible option for the sector the closure of universities, which has resulted in, among other things, the cessation of all courses and teaching activities. The duration of this closure varies from one university to another, depending on the severity of COVID-19 contamination in each country. As shown in Table 5.2, it can range from 2.5 months to 12 months with an average closure of 7.9 months. It is clear that such duration of closure has a definite impact on the course of university calendars, including the essential dates for graduation, and the quality of education, the impact of which would only be known in two or three years' time.

The duration of the universities closure, as shown by the information provided in Table 5.2, is very proportional to the degree of contamination in countries with the COVID-19 pandemic, such as Algeria (USTHB) and Nigeria (ABU), which have the longest duration of closure, respectively, 12 months and 10 months.

Finally, it should be noted that some initiatives have been identified in some universities to try to respond positively to the pandemic and adapt in order to continue to provide distance education. First of all, it is important to note that not all courses can be delivered remotely. This is the case with courses that require the manipulation of materials in laboratories or practical work on the ground, etc. However, for courses that seemed possible to be delivered remotely, the results were also very mixed or

Table 5.3 Summary of main issues and challenges faced by African HEIs and COVID-19 pandemic related impacts

Subsector	Issue	Challenge	COVID-19 impact
HEIs in general	• Not considered as among top priorities by governments • no investment from governments • Sector contribution to countries development • No business continuity plan (BCP)	• Receiving relevant and appropriate funding from governments • contributing to countries development through research outputs and skilled as well as top quality human capital through high standard training • Designing relevant and effective multi-hazard BCP	• No adaptation capacity • Lockdown as the only measure
Administration	Not sufficient and irregular government subsidies	Providing effective and high quality services any time	Lockdown and cessation of service delivery
Research	• Funding availability • Conducting research on field • Relevance of research themes	• Obtaining funds from governments, • Research outputs supporting development efforts	• No reallocation of public budget to HIEs • Funds received from international partners to support countries facing COVID-19 allocated to health service delivery support and social safety nets
Teaching	• Limited infrastructure in quality and number • Access to Internet • Access to distance teaching materials • Home environment	• Delivering excellent quality lectures and courses Continue lecturing without interruption • Standard quality lectures/courses even without appropriate training and equipment, • Distance learning operationalization and risk of marginalization of the majority of students	HEIs general lockdown and cessation of teaching due to lack of BCP and impossibility of distance learning

even negative. The study showed that, mainly, three obstacles are at the origin of these unsatisfactory results and also difficulties encountered: the first is the lack of access to technology, the second is the lack of access to learning materials, and the third is the inadequate home learning environment on both sides, teachers and students. This finding is also supported by other studies, including one conducted by Elearning Africa & EdTech Hub (2020). In addition, these barriers are reinforced by the problem of infrastructure such as electricity, connectivity, and appliances.

The barrier to lack of access to technology refers to the unavailability and inaccessibility of the Internet for the large majority of teachers. Since they have not received any financial support, they are forced to spend money out of their own pockets if they want to adhere to this strategy. This solution is not sustainable. Secondly, with regard to the obstacle related to the lack of access to learning materials, these educational materials adapted to the situation are not available in large quantities and cannot be obtained free of charge. Again, the same problem of having to pay out of their own pockets remains if no financial support is received from governments. With regard to the third obstacle, namely the problem of the home learning environment, it is clear that the private homes of lecturers are not designed and might not be equipped for this end. These three obstacles represent more than half the burden of the difficulties faced by teachers in this aspect of online teaching using the Internet (Elearning Africa & EdTech Hub 2020).

Furthermore, it should also be noted that most teachers have not received training either in designing or delivering online courses. This could once again affect the quality of education. On the student side, there was no additional financial support from governments. There is a real risk of increasing inequality between students from better-off families who would have advantages of this new modality of distance teaching in contrast to those who would not be able to afford the cost of this new modality.

The commonality of the three components is the lack of a business continuity plan or, in the few cases where it exists, it has not been operational because it is not suitable to the context of a shock as large as the COVID-19 pandemic. All these points call for a thorough rethinking of the African education system in order to increase its adaptation capacity to the shock and strengthen its resilience to crises. What lessons can be learned from this pandemic situation to help put the sector in its right place?

5.3.3 Lessons Learned for Resilience Building

The above developed explanations show that the higher education and research sector in the African continent has suffered a lot as a result of the shock caused by the COVID-19 pandemic. Infrastructure that is often far from meeting the requirements of modern education and quality research, on the one hand, and the largely inadequate quantity compared to the real needs of countries, due to insufficient investment in the sector, on the other hand, are one of the main factors of vulnerability to shocks

in the higher education sector. The low state subsidies that barely enable universities to function are the root cause of the sector's inability to make investments and to acquire high-performance equipment. From disaster risk management perspective, the absence of a business continuity plan is a real handicap for the sector. This does not allow for adequate and effective preparedness, recovery and mitigation measures that can ensure the entire sector (administration, research, and education) has a real adaptation capacity and its resilience, particularly in the face of such major shocks as the COVID-19 pandemic.

During the crisis caused by this pandemic, the way in which the higher education and research sector has been affected and the responses provided by governments and university authorities have shown how fragile and vulnerable the sector is to shocks and the level of resilience is very low (Randriamanampisoa et al. 2021). What is positive about this COVID-19 crisis is that it has raised awareness, particularly among government authorities, of the sector's vulnerability to shocks and the need to invest more in it in order to strengthen the sector's adaptability and also to increase its level of resilience. This means reorganizing the sector, courses, and research will need to be less dependent on the current method of face-to-face teaching but more open with online and remote options carried out by so trained teachers in the subject. Of course, this will be facilitated first, by the design of adequate and multirisk business continuity plans, considering selected major shocks, including in particular, hazards such as COVID-19 pandemic which is still striking the world and the African continent with its second wave, even more severe, dangerous, and dreadful. Second, governments' investments to provide HES actors (administration staff and lecturers) with broadband Internet connections that are much more accessible to them are urgently needed to mitigate the negative impact of the crisis to the sector (Elearning Africa & EdTech Hub 2020). In this way, the higher education and research sector could regain its place and its social role as both a provider of quality human capital and an economic catalyst for development.

5.4 Conclusion

The pandemic of COVID-19 has shaken the world and affected in a very significant way all sectors without exception but with different levels. All industries have been and are continuing to be affected. The higher education and research sector is among those most affected. In terms of responding to this disaster, the only option taken by all universities at the continental level is the closure of institutions, which means that there is no capacity for shock adaptation and a very low level of resilience. The main cause of this situation is the lack, or even the non-existence, of investment in the sector for several decades, going back to the post-colonial period, when the policy and strategy developed and followed by successive governments, in the field of education, were mainly of a social nature and oriented toward mass education and the fight against illiteracy. Even if the second wave of this COVID-19 pandemic is not part of the core issues this paper is addressing, the response received from colleagues

in other universities when completing the questionnaire allow us to have a broad idea of how universities are responding to this second wave. Despite of some encouraging measures university authorities take, such as continuation of thesis defense sessions, fundamental courses taking place for engineering schools, for example, with more appropriate barrier and safety measures, etc., the willingness for real investments is still lacking. The HEIs still continues to be part of second row priorities, even if it is more or less understandable because of the current situation of social crisis caused by COVID-19 pandemic. The reorganization of the system, which requires adequate investment to enable the sector to be equipped with high-performance and modern equipment that favors distance education, seems to be the solution for a more resilient HEIs in future.

References

Abbas Q, Mujahid-Mukhtar E (2000) The role of human capital in economic growth: a comparative study of Pakistan and India. Pak Dev Rev 39(4):451–473. http://www.jstor.org/stable/41260279. Accessed 3 May 2021

Adriansen HK, Madsen LM, Jensen S (2016) Higher education and capacity building in Africa. The geography and power of knowledge under changing conditions. ISBN 9780815394051, Published December 4, 2017 by Routledge, 262 Pages 12 B/W Illustrations

African Union/Centre for Disease Control and Prevention (2021) https://www.coronavirus-statistiques.com/stats-continent/coronavirus-nombre-de-cas-afrique/. Accessed 3 May 2021

Association for the Development of Education in Africa (2018) Why investments in higher education and research in Africa are so important? https://www.adeanet.org/en/blogs/why-investments-in-higher-education-and-research-in-africa-are-so-important. Accessed 26 Apr 2021

Boztosun D, Aksoylu S, Ulucak ZŞ (2016) The role of human capital in economic growth. In Economics World, May–June 2016, vol 4, no 3, pp 101–110. ISSN 2328-7144. David Publishing Eds. https://doi.org/10.17265/2328-7144/2016.03.001

Clark BR (1983) The contradictions of change in academic systems. High Educ 12:101–116. https://doi.org/10.1007/BF00140275

Cooper-Knock SJ (2015) Higher education in Africa: four key challenges. Democracy in Africa, November 2015. Available at http://democracyinafrica.org/higher-education-in-africa-four-key-challenges/

eLearning Africa & EdTech Hub (2020) Impact de la pandémie de COVID-19 sur l'éducation en Afrique et incidence sur le recours aux technologies. Sondage sur l'expérience et les opinions des éducateurs et spécialistes de technologies. Creative Commons Attribution 4.0 International—UKaid. September 2020. https://doi.org/10.5281/zenodo.4018774

Marginson S (2010) Higher education in global knowledge economy. Procedia Soc Behav Sci 2(5):6962–6980, December 2010. https://doi.org/10.1016/j.sbspro.2010.05.049. Available at https://www.researchgate.net/publication/222419363_Higher_Education_in_the_Global_Knowledge_Economy. Accessed 4 May 2021

Muller J, Cloete N, Van Schalkwyk F (2017) Castells in Africa—Universities and Development. African Mind Publishing, Cape Town South Africa

Ogbodo CM, Efanga SI, Ikpe UG (2013) Knowledge production in higher education: policies and practices in Nigeria. Int Educ Stud 6(12). ISSN 1913-9020 E-ISSN 1913-9039. Published by Canadian Center of Science and Education. https://doi.org/10.5539/ies.v6n12p9. Available at https://doi.org/10.5539/ies.v6n12p9. Accessed 29 Apr 2021

Ong'ayo AO (2008) Political instability in Africa, where the problem lies and alternative perspectives. African Diaspora Policy Centre

Randriamanampisoa H, Salava J, Razanakoto T, Andrianjakatina A, Ratsimbazafy R, Lazamanana P, Randrianalijaona M (2021) The role of social links on community resilience and development: the case of Ambaro-Bekibo, Vatovavy Fitovinany administrative region—Madagascar. Int J Appl Sci Eng Rev 2(2), Mar–Apr 2021. ISSN: 2582-6271

Randrianalijaona M, Holloway A (2015) Advancing DRM in Madagascar, the role of HEIs: the case of DMGRC. Cambridge University Press

Vénon JB (2010). L'Afrique post-indépendances: 50 ans de crises ? L'exemple de Madagascar. In Afrique contemporaine 2010/3 (N° 235):115–126

Chapter 6
Disaster Risk Governance in the Midst of the COVID-19 Pandemic in Central America: The Case of Guatemala

Victor Manuel Garcia Lemus

Abstract The Sendai Framework for Disaster Risk Reduction includes biological threats as a responsibility of national disaster response systems; however, globally, these systems have not incorporated biological threats as part of their daily work, and its agenda is focused on traditional natural events such as earthquakes, volcanoes, landslides, and hydrometeorological events. This lack of preparation of the national emergency systems for biological emergencies and their delay in meeting the goal of the Sendai Framework, which establishes the need to update governance frameworks, have been key in the response to the pandemic caused by the coronavirus as of 2019, in the case of Guatemala, disaster risk governance is threatened by the inability of the State and its government to make the necessary changes to the disaster risk management system. In this article, we analyze how the national disaster response system was totally displaced from managing the pandemic, for not having the institutional capacities to manage the problem and the leadership was assumed by the Ministry of Health and they resorted to appointing a Presidency Commissioner for the management of Covid-19. The lack of interest in strengthening health institutions and their capacity to deal with Covid-19 cases has not made it easier to manage the pandemic. On the other hand, the constant weakening of the justice system for the benefit of widespread corruption seeks to legalize an illegitimate system of looting from the state, as an accepted practice, so that the level of trust of society in the government constitutes a serious threat to democracy and puts governance in the country at risk.

Keywords Sendai framework · Disasters · Coronavirus · Governance

The COVID-19 pandemic is a systemic, global, and significant threat related not only to public health, but also to all human activities, whether of an economic, social, or environmental nature. To understand its relationship and impact on disaster risk

V. M. G. Lemus (✉)
Especialista en GRD en Procesos de Desarrollo, Presidente REDULAC/PRD, Guatemala, Guatemala
e-mail: presidencia.redulacrrd@gmail.com

T. Izumi et al. (eds.), *Safety and Resilience of Higher Educational Institutions*,
Disaster Risk Reduction,
https://doi.org/10.1007/978-981-19-1193-4_6

governance, it is necessary to review some global and national governance frameworks that allow the identification of related aspects, starting from the premise that good governance facilitates the proper management of processes in any activity, in this case, in the context of a global emergency.

6.1 Threats According to International Frameworks

We take the Sendai Framework for Disaster Risk Reduction 2015–2030 (UNDRR 2015) and the approved glossary for its implementation, "Report of the Open-ended Intergovernmental Expert Working Group on Indicators and Terminology Related to Disaster Risk Reduction 2016 (UNDRD 2016)" as a reference. Both have been approved by the General Assembly of the United Nations and recognize five types of threats (processes and phenomena) that cause disasters: (1) biological, (2) environmental, (3) geological, (4) hydrometeorological, and (5) technological. The COVID-19 pandemic is a biological threat, which should be the responsibility of national emergency management or disaster risk management systems. However, such systems are primarily focused on emergency response, that is, reactive in nature, and have focused on geological, environmental, and hydrometeorological threats, with a predominant physicalist approach to natural disasters.

6.2 Approaches to Disasters

The physicalist approach explains disasters as the result of physical processes or phenomena and therefore requires a physical or structural approach (Garcia 2020). Thus, if a river overflows, we must build dams, canals, dykes, and so on. On the other hand, the naturalistic approach explains disasters as a result of and responsibility for natural phenomena, leaving humans and their relationship with the territory out of responsibility (Garcia 2020). These approaches neglect to address the responsibility of humans in the use of the territory and its resources, that is, their responsibility in the construction of disaster risk. The management of biological threats and their effects have traditionally been attributed as a responsibility of the health sector; however, when a biological threat transcends the field of health and its effects are systemic (economic, social, and environmental), they are the responsibility of the State as a whole. According to the Sendai Framework, biological threats are part of the processes that must be managed through disaster risk management systems (UNDRR 2015).

The absence of this vision in the current systems does not allow the development of capacities for the management of biological threats. When the pandemic began, the national disaster risk management systems did not have the necessary capacities to manage the biological emergency and its systemic impacts, therefore, it does not assume the leadership for its management. This deficiency of administration and

institutional competence depends on many aspects; however, in this chapter, we focus on issues related to disaster risk governance and how this affects the management of the COVID-19 pandemic and its impacts. We analyze this duality of leadership and leadership that has occurred in many countries and call into question both national emergency management systems, ministries of health, and the functioning of the State in general, as the final repository of responsibility of the common good.

6.3 Systemic Threats

The 2019 Global Assessment Report (GAR) devotes a section to the analysis of the complexity of the links between disaster risk and other types of risk, especially its interrelationship with sustainable development processes, highlighting that the Sustainable Development Goals and the five major global agendas approved by the United Nations system, such as the Climate Change agendas (Paris agreement), Disaster Risk Reduction (Sendai Framework), Humanitarian assistance (Istanbul Declaration), urban risk and territorial development (Habitat III, Quito), and financing for development (Addis Ababa) should be promoted synergistically. This complexity of the risk nexus and its multiple dimensions consolidates a systemic and multi-threat approach. This indicates that national disaster risk management systems with these capabilities are required (UNDRR 2015).

COVID-19 is classified as a systemic threat, due to its ability to affect not only people's health, but also cascade economic, social, and environmental systems. From my perspective, it is also a synchronous threat because the causes and effects occur at the same time. As a consequence, the quarantine established to reduce the likelihood of contagion affects economic and social activities and also has environmental effects. The economic impacts as a result of the reduction or closure of economic and financial activity are mainly a reduction in productivity, the fall in exports, the contraction in the consumption of goods, the impact on tourism activities, unemployment, and, finally, a contraction of the economy in general.

Social impacts are related to the interruption of community and family relations and the consequent impact on mental health, in addition to the suspension of mass activities such as sports, culture, religious activities, shows, and mass gatherings that affect people's incomes and social fabric. These aspects include the reduction of educational and health activities that are essential for maintaining personal and social development.

The main environmental effects can be positive, such as the reduction of greenhouse gas emissions and pollution in general, and negative, such as pollution by poorly managed medical waste. We can say that due to its effects, as a biological threat, COVID-19 highlights deficiencies in the development of a country, its disaster management, health, economic, and social systems, and the environmental system, which severely affects disaster risk governance.

6.4 Disaster Risk Governance and the Sendai Framework

Disaster risk governance is a set of legal instruments that allow the proper management of risk and requires a series of instruments, including: (1) the National Development Policy and Plan that should consider the variable disaster risk as a priority issue, (2) the National Policy and Plan for Disaster Risk Management, (3) the existence of an institution responsible for disaster risk management to which the administration is delegated and clear responsibilities are given to assume leadership of the problem, (4) the allocation of the budget necessary for the fulfillment of its functions, (5) laws and regulations, and (6) the existence of fines and sanctions for non-compliance with the law and its regulations, implemented by a judicial body independent of the executive body.

In January 2005, the Second World Disaster Summit was held in the city of Kobe, the capital of Hyogo Prefecture, Japan, which adopted the Hyogo Framework for Action (2005–2015). This framework promoted five priorities: (1) Ensuring that disaster risk reduction is a national and local priority with a strong institutional basis for implementation. (2) Identify, assess, and monitor disaster risks and improve early warning. (3) Use knowledge, innovations, and education to create a culture of safety and resilience at all levels. (4) Reduce underlying risk factors. (5) Strengthen disaster preparedness to ensure an effective response at all levels (UNDRR 2015).

During the decade of the Hyogo Framework for Action, the priority was to strengthen institutions, but the updating of governance systems was postponed. In 2015, when the evaluation of the progress of the Framework was carried out, it was evident that the priorities that made the least progress were (3) and (4), indicating that knowledge of disaster risk, the culture of resilience, and risk governance did not advance and that they still present weaknesses; for this reason, in 2015, on the occasion of the third world summit, held in the city of Sendai, capital of Miyagi Prefecture, Japan, the Sendai Framework for Disaster Risk Reduction 2015–2030 was formulated and four priorities were presented:

- Priority 1: Understand disaster risk.
- Priority 2: Strengthen disaster risk governance to manage such risk.
- Priority 3: Invest in disaster risk reduction for resilience.
- Priority 4: Increase disaster preparedness for an effective response and "rebuild better" in the areas of recovery, rehabilitation, and reconstruction (UNDRR 2015).

This international framework once again puts disaster risk governance at the center of the agenda. In addition, it approves seven global targets, within which, objective (e) proposes "Significantly increase the number of countries with disaster risk reduction strategies at the national and local levels by 2020" (UNDRR 2015) and establishes two indicators to measure and monitor their compliance:

- E-1. Number of countries adopting and implementing disaster risk reduction strategies at the local level in line with the Sendai Framework for Disaster Risk Reduction 2015–2030.
- E-2. Percentage of local governments adopting and implementing disaster risk reduction strategies at the local level in line with national strategies. Information should be provided

> on levels of government below the national level that are responsible for disaster risk reduction. (UNDRR 2015)

It is important to note that this target must be achieved by 2020. The Sendai Framework proposes monitoring its progress and the fulfillment of its commitments through the "Sendai Monitor." Each year, countries will submit a progress report, which will make it possible to determine delays and implement corrective measures. In setting out these global priorities and objectives, the Sendai Framework is promoting an analysis of legal frameworks and governance processes for disaster risk, which had to be reformed and updated in the period from March 2015 to December 2019. This objective establishes a preparatory period for governance frameworks for countries from 2020 to 2030–4030 to develop mechanisms and instruments for disaster risk governance and to effectively reduce disaster risk and strengthen resilience.

6.5 Risk Governance and COVID-19 in Guatemala

The governments of the Central American region have a Regional Secretariat within the Central American Integration System (SICA), known as the Coordination Center for the Prevention of Natural Disasters in Central America, CEPREDENAC, which has a Central American Policy for Comprehensive Risk Management (PCGIR) approved in 2005 and updated based on the Sendai Framework in 2018. This policy is the regional benchmark for countries to begin their updating processes; however, the Central American countries have not made significant progress in updating the legal frameworks.

In the case of Guatemala, the disaster risk governance framework is included in Legislative Decree 109-96 and is called the "Law on the National Coordinator for Disaster Reduction." Enacted in 1996, it was a milestone that placed Guatemala as one of the countries with a visionary law adjusted to the times. This law had two important antecedents: first, the above-mentioned celebration of the International Decade and the Yokohama Strategy and Framework for Action; second, the signing of the Peace Accords in December 1996. Guatemala's 34-year civil war had a notable impact on its institutional decline, its democratic credibility, and the structure of its totally polarized social fabric. During this period, there were constant coups d'état and electoral fraud, until, in 1985, the rule of law resurfaced when a new constitution was adopted.

Guatemala is a rich and diverse country, there are 23 Mayan peoples, the Garifuna people, the Xinca people, and the Ladinos product of miscegenation in its territory. It has an area of 108 thousand square kilometers and 17.6 million inhabitants, that is, it is a small country with a considerable predominantly young and economically active population. The main threats are hydrometeorological, geological, and environmental threats. It is a developing country, so the technological threats that are present do not yet constitute a disaster risk problem of national importance. The biological threats in the last 40 years were cholera and H1N1 influenza, so its emergency response

system does not incorporate COVID-19 since the Ministry of Health is typically responsible for disease outbreaks.

With regard to disaster risk governance, in 2016, academia and civil society began a process of formulating a new law. In addition, with the support of the United Nations Regional Office for Disaster Risk Reduction, the process of formulating a National Plan for Disaster Risk Reduction began in 2018. Understanding this process is critical for analyzing the management of the COVID-19 pandemic.

As a member of the Citizen Convergence for Risk Management, the University of San Carlos de Guatemala (USAC) began a process to formulate a new disaster risk management law in March 2016. This process began within this academic institution based on three aspects: First, the University is one of the few institutions in the country that has a law initiative. Second, it has a lot of credibility within Guatemalan society, as it is generally one of the three institutions best evaluated by Guatemalan society. Third, it has a Center for the Study of Safe Development and Disasters, which took the lead in the construction of the law. These characteristics give the university a leading role in the processes of national development, since it is also the only public university in the country and a rector of higher education in the State of Guatemala.

In coordination with the institution that is responsible, the National Coordinator for Disaster Reduction (CONRED), three scientific events, 17 discussion tables, and two workshops on the integration of the bill were held, and in 2017, 2017 proposals and suggestions were submitted to CONRED for analysis. In the course of this discussion process, the central government changed the CONRED authorities, which unfortunately totally changed the institutional vision, from an Executive Secretary with a process vision to one with a focus on emergencies. The process of intersectoral dialogue was interrupted, and with the support of the World Bank, the draft law was reformulated and given an emergency approach and sent to the National Congress in 2018. This draft law was analyzed by the corresponding Commission to determine the opinion on the basis of the discussion, which has to date not been published. This leaves the country in breach of its commitments as a signatory to the Sendai Framework and, therefore, as one of those that has not met targets related to the upgrade of disaster risk governance frameworks by 2020.

In the case of the process of formulating the National Plan, initiated in 2018 and supported by the United Nations Regional Office for DRR-UNISDR, it was successfully concluded in 2019. Its main strength is that it is fully harmonized with the Sendai Framework and its main weaknesses, the lack of a law to facilitate it and the lack of budget for its implementation. This Plan was built through a participatory process, and the instruments developed by the United Nations system were used, making it a major step forward. Within the countries of the Central American Integration System, only the Dominican Republic and Guatemala have a harmonized plan based on the Sendai Framework. Costa Rica updated its Plan in 2016, but it has a different format and a very typical vision of disaster risk management.

With regard to the analysis of governance, an examination of the aspects that I consider most important in establishing the frame of reference of the legal framework that governs the processes of disaster risk governance in Guatemala is as follows:

1. The current law, adopted in 1996, is derived from two processes, one international and one national. At the international level, the Yokohama Framework and Strategy and at the national level, the signing of the Peace Accords.
   In the case of the international precedent, Guatemala is a signatory of the international frameworks adopted by the United Nations and, therefore, cooperates with the international community to promote it. For this reason, the new law was approved on the basis of the commitments made to the international community. However, this did not happen when the commitment to implement the Hyogo Framework for Action was signed in 2005, as there was no attempt to improve the legal framework and adapt it to ensure that resilient countries and communities were enacted in this international framework. In the case of the Sendai Framework in 2015, the central government has shown no real interest in improving risk governance, as the military would obviously lose control of the issue, which is crucial for this sector. This is because every time a state of calamity is declared, resources are approved that are invested without bidding and that are used to equip or repair aircraft, on the pretext of using them for humanitarian aid.
   In the case of the national antecedent, the Peace Accords constitute a significant national social agreement that made it possible to move from a society organized for war to one in democratic coexistence, within the framework of the rule of law, after a long internal conflict of the armed forces that lasted 34 years. However, the new law, needed to change other laws, which was not done and persisted the approach of national security and civil defense promoted mainly by the army, to the detriment of a legal approach. Therefore, in the law of public order, within which are the states of prevention and calamity among others, a strong approach to guidance based on national security, not disaster risk management, persists. The system is therefore under the supervision of the Ministry of National Defence, which presides over it.
2. Its focus is the one predominant in 1996, which is on natural disaster reduction rather than disaster risk. Currently, disaster risk management comprises three management activities or approaches: prospective, corrective, and compensatory. However, the current law is based on the disaster cycle, focused on disaster and not risk, and even less on what is referred to as the resilience of the territory.
3. The National Coordinator for Disaster Reduction is headed by an Executive Council, chaired by the Ministry of Defence and composed of institutions primarily related to the response. The planning institutions are not included. This allows for a lack of agreement between those who plan development (i.e., better perform forward-looking/corrective/recovery management) and those who perform reactive management. There are therefore large gaps in governance or administration that cause national planning without disaster risk considerations.
4. There are four levels of territorial management: national, regional, departmental, and municipal/local. However, as a country where the national security approach

predominates, the activities of the executive are highly centralized and concentrated at the national level. This implies that emergency management capabilities are more developed at the central or national level while the provincial, departmental, and municipal/local levels are very limited. The Municipal Code states that mayors are responsible for territorial administration, but do not have the capacity to exercise this function, including emergency management.

5. CONRED has a scientific institution in charge of the study and monitoring of natural threats, the National Institute of Seismology, Volcanology, Meteorology, and Hydrology (INSIVUMEH). This scientific body belongs to the Ministry of Communications, Infrastructure, and Housing, which needs it mainly for situations related to civil aeronautics. Therefore, it does not have a hierarchical and institutional dependence on CONRED.

   INSIVUMEH has a Scientific Council that focuses mainly on making risk statements, neglecting its function of constructing prospective scenarios for territorial development. Social information is provided by the National Institute of Statistics, and epidemiological information is the responsibility of the Epidemiology Centre of the Ministry of Health. This fragmentation of the generation of information for decision-making is a fundamental element for the inadequate management of disaster risk, since, in addition, they do not generate information at appropriate and specific territorial scales related to hazards.

5. Within Guatemala's institutional framework, a national coordinator does not execute projects. Therefore, CONRED only coordinates processes and has a significant weakness in terms of the promulgation of its normative agreements since the Executive Council for Disaster Reduction issues agreements of a third level in the hierarchy of laws and its applicability is therefore very weak.
6. The budget allocated to CONRED has two fundamental purposes: the payment of staff and the possibility of applying for an emergency fund that generally does not have funds, regardless of the dismissal. This background is activated when there is a calamity or disaster. When a disaster strikes, the country must go into debt due to lack of funds and this compromises its financial resilience.
7. The law provides for sanctions and fines, but there is no judicial body responsible for executing them; therefore, they do not have adequate applicability. Recently, the Public Prosecutor's Office and the Office of the Comptroller General of Accounts of the Nation are incorporating situations related to emergencies and professional and criminal responsibility into their functions, but they are protected by general laws.
8. There is virtually no option of an administrative career, practically 100% of the staff have no administrative career; therefore, every time there is a change of authority, there is a change of workers at all levels, so experienced technicians are lost. This situation has led to this institution constituting spoils for the payment of political debts, which has a negative impact on institutional capacities. Although the regulations establish requirements to be hired, these are ignored by the responsible authorities.

As we can see, institutional weaknesses are the key to preventing this institution from playing an important role in managing the pandemic.

The other actor in the management of the pandemic is the Ministry of Health, an institution totally weakened after the signing of the Peace Accords in 1996. The government at the time, with a neoliberal mentality, dismantled the institution, first through an early retirement process offered to workers in permanent budget lines and then through implementing the Comprehensive Health Care System (SIAS), which put primary health care in the hands of private providers, especially the first level of care in rural communities. Non-governmental organizations were contracted to cover specific territories in exchange for annual payments and compliance with pre-established health indicators. This led to the suspension of public investment in infrastructure in favor of the growth of private providers. When the new government came to power in 2000, it changed the scheme again, gradually weakening the provision of private service providers but without strengthening the public system.

On the other hand, the Guatemalan Social Security Institute (IGSS) serves the sector of workers who contribute to that organization, which covers 17% of the population according to its data. The institute is maintained through worker and government contributions. The contribution of workers amounts to 4.83% of their salary, and a further 10.67% employer contribution. However, the State of Guatemala owes the IGSS an estimated 7 billion dollars. The health budget in Guatemala constitutes between 2 and 2.5% of its gross domestic product (GDP). However, the World Health Organization recommends a percentage of no less than 4% of GDP, that is, investment in health is very low. COVID-19 has accelerated the crisis of the Ministry of Health as an institution that provides health services. If we consider the ratio of beds and doctors is less than one per thousand inhabitants and that COVID-19 patients require intensive care beds with mechanical ventilation capacity, the expected scenario before the pandemic was a collapse of the health system, which actually happened in the first three months of the emergency (June–July 2020). The first case of COVID-19 was reported in Guatemala on March 13, 2020 and, as the pandemic progressed, a quarantine was established from April 4. To address this problem, the Guatemalan government acquired a debt of approximately $1.3 billion to (1) increase the capacity of intensive care beds, (2) provide financial assistance to people who were unemployed, (3) provide food boxes to vulnerable families, and (4) rescue companies.

The government's first step was to try to maintain strict control of information on cases, so it has been very difficult to establish the number of actual cases with certainty, partly because only the Ministry of Health was authorized to perform diagnostic tests. The reports of the social observatories seriously questioned the reliability of the data, especially in cases of mortality. A discrepancy was detected in the data between the Ministry and the register of deaths, which led to serious questioning of the role of the Minister of Health, who was finally dismissed on June 19. The overflow of the health system and disaster management led the president to recognize the weaknesses in the management of the pandemic, and as of May 20, appointed a presidential commissioner for the management of COVID-19, which was not perceived only as the recognition of the incapacity of the responsible institutions,

but also to question the duplication of functions and budget. Health workers have consistently reported non-payment of salaries and lack of protective equipment.

Due to the government's lack of credibility and suspicion of corruption in the handling of funds, Guatemalans initiated a series of protests. Cases of corruption in other ministries of state were also revealed. Cases of political patronage were detected in the allocation and distribution of humanitarian aid for the unemployed and vulnerable. This situation was overwhelmed when the impacts of Hurricanes Eta and Iota in November highlighted the government's inability to manage a systemic and multi-threat crisis caused by the combination of the effects of COVID-19 on economic, social, and economic systems.

The situation was addressed when the Congress of the Republic irregularly approved a budget for the 2021 with budget cuts for the Ministry of Public Health, a decrease in the budget allocated to the attention of food insecurity and malnutrition processes that affect more than 50% of the population under five years of age, the notorious reduction in the budget of justice and human rights organizations, the lack of allocation of funds for COVID-19 care, and to address the recovery process of those affected by hurricanes Eta and Iota. On the contrary, budget increases were made to the army and Congress of the Republic for the construction of a new building. The process of social disagreement and rejection of these measures was generalized to all social sectors and, since November 21, has led to many mass marches calling for the resignation of the president, and the purge of the National Congress and the justice system, especially the Prosecutor's Office of the Public Prosecutor's Office. In response to social outcry and disagreement, the government backtracked the approval of the budget, dismissed the presidential Commissioner for COVID-19, and disbanded the Government Center. The latter, an institution created with the same functions as the vice presidency of the republic and is considered a center of corruption.

In the last week of November, the president of the Republic created a multisectoral commission to discuss the new budget, which was composed of thought elites and churches, in an attempt to reduce social pressure. This commission disintegrated after the sectors felt coerced and denounced the government's lack of clarity to establish a transparent and reliable process to discuss it. The mass demonstrations, the traditional Day of the Dead celebrations, and the concentration of the population affected by the hurricanes in shelters is causing an increase in cases and deaths from COVID-19. The authorities acknowledged a second wave of cases in December 2020, which could lead the country to the need for new restrictions. As of December 12, 2020, the Ministry of Health recognized 127,786 confirmed positive cases, with a cumulative incidence of 758 cases per 100,000 inhabitants and 4345 deaths, with a case fatality rate of 3.4% (MSPAS Electronic Portal).

This complex and unstable political, economic, social, and epidemiological landscape is increasing social protests and small outbreaks of violence, which can generate a very dangerous state of ungovernability. In the short term, there does not seem to be a clear solution, and the country is entering a climate of confrontation between the government and social groups that could lead to its collapse. Amid the

lack of consensus on the adoption of the budget, the outlook for the next year is not encouraging.

As for the possible epidemiological control of the epidemic, the country has negotiated its entry into the mechanism of the Pan American Health Organization, which establishes that Guatemala will have a supply of 3 million doses of vaccine for the first quarter of 2021. This will apply to health, safety, and vulnerable personnel, especially older adults and people with diseases that are associated with higher mortality from COVID-19. This vaccination process will also confront the reticence and mistrust among Guatemala's Mayan population, which traditionally associates vaccines with sterilization processes and the consequent extermination of their people.

This experience on the management of the pandemic in Guatemala is an interesting case study that can be characterized and used to identify the lags of national emergency management systems and that underdevelopment is an element that determines the capacity of states, not only to manage disasters, but will probably determine the management of their recovery. This pandemic has deepened existing development gaps, and a serious economic downturn is forecast for the short term. In its 5th special report on the pandemic, published on June 15, the Economic Commission for Latin America (ECLA) estimates that world GDP will decrease by 5.2%, and the volume of world trade in goods will decrease by between 13 and 32%. In the case of Central America and the Caribbean, it estimates that one of the greatest impacts will be seen in the tourism sector, which will decrease by 35% and in its exports, which will fall by 23%.

6.6 Conclusion

The following conclusions can be drawn:

1. Disaster risk governance in Guatemala is threatened by the inability of the state and its government to make necessary changes to the disaster risk management system.
2. The national disaster response system was totally displaced from the management of the pandemic because it did not have the institutional capacities to deal with the problem, and leadership was assumed by the Ministry of Health and the Presidential Commissioner for the management of COVID-19.
3. The lack of interest in strengthening health institutions and their capacity to deal with COVID-19 cases does not facilitate the proper management of the pandemic.
4. The constant weakening of the justice system in favor of widespread corruption seeks to legalize an illegitimate system of state looting as an accepted practice.
5. Society's level of trust in government constitutes a serious threat to democracy and puts governance in the country at risk.

Bibliography

Electronic Portal (s.f.) *Coverage of institutional services.* Guatemala
Electronic Portal of the MSPAS (s.f.) Guatemala
Garcia, V. (2020). Management of Territorial Resilience to Disasters. SEA
UNDRD (December 2016) Report of the group of experts. New York, EU
UNDRR (2015a) GAR 2015
UNDRR (2015b) Sendai framework 2015–2030. New York, EU

Chapter 7
Looking Ahead While Leaving No One Behind: Resourcefulness and Resiliency Among North American Universities

Eleanor Vandegrift and Mellissa Withers

Abstract Universities around the globe have faced a multitude of educational challenges during the pandemic, including how to rapidly shift to a remote learning environment while also ensuring equitable access among all students. Many faculty and students were asked to quickly adapt to a virtual learning environment for the first time, and universities have been tasked with providing support through professional development and technology infrastructure. Despite drastically reduced budgets, many universities in the North America have demonstrated extraordinary resiliency and resourcefulness in providing meaningful, rigorous, quality, and high-impact experiences for their students. Using an equity lens, in this chapter, we will outline best practices and novel solutions relating to both student learning and faculty teaching.

Keywords Universities · North America · Pedagogy · Innovation · Higher education

Through a series of 15 case studies, we will analyze examples of how universities in the North America have effectively responded to challenges such as:

- designing effective online courses,
- providing students with virtual experiential education and leadership opportunities,
- engaging international students,
- creating a sense of community for students across geographies,
- supporting students' learning in the new online environment, and
- leveraging technological tools to meet shared educational challenges.

E. Vandegrift
Global Studies Institute, University of Oregon, Eugene, OR 97403, USA
e-mail: ellyvan@uoregon.edu

M. Withers (✉)
Department of Population and Public Health Sciences, Keck School of Medicine, University of Southern California, Los Angeles, CA 90089, USA
e-mail: mwithers@usc.edu

T. Izumi et al. (eds.), *Safety and Resilience of Higher Educational Institutions*,
Disaster Risk Reduction,
https://doi.org/10.1007/978-981-19-1193-4_7

Innovation in teaching methodology has dramatically transformed the virtual educational landscape and required faculty to consider the student experience in new ways. Creative program development has allowed students to have new leadership and cross-cultural learning experiences. The case studies in this chapter provide lessons that have the potential to improve university-level education and help students thrive in a remote and in-person academic environment beyond the pandemic. Universities cannot be stagnant but must adapt to a changing world. Innovation and resiliency will help universities respond not only to COVID-19 but have the potential to inform policies and procedures to respond to future local or global challenges.

7.1 Introduction

In the rapid transition to online, remote, and virtual teaching in 2020 faculty and students across North America were suddenly faced a new and novel learning environment. Online learning programs have grown across higher education and approximately a third of US students had taken at least one college course online by fall 2019 (Lederman 2019). However, for most of the estimated 26.3 million students across the United States (19.9), México (4.3), and Canada (2.1), an online, remote, or virtual college or university[1] experience was not what they had expected or signed up for (Muniz 2020; Maldonado-Maldonado and Rodriguez Gómez 2019; Statistics Canada). For many students, the expectations for online learning were brand new. Additionally, many faculty were leery of the effectiveness of online education before the pandemic and even moving into fall 2020 (Lederman 2020a, b).

For many students, this rapid transition to online and remote learning was an unwelcome surprise. Students who had signed up for a residential college experience suddenly found dorms closed or never opened in the fall. They were quickly forced to return home, where they lacked the support of the peer mentors that they generally would have had at a residential university. Some also returned to home situations with less access to other resources (technological, mental health, steady employment) than on campus. The campus closures also exposed large inequalities among students, as described by two extremes with some students moving into their family luxury vacation homes at resort destinations while other returned home to additional obligations, such as working in family business or caring for younger siblings (Casey 2020). Student mental health has been of grave concern as students deal with the stressors of their upended college experience, family dynamics and responsibilities, ongoing pandemic, and rapid transition to online education (Son et al. 2020). Universities have been forced to grapple with ways in which both academic, social, and experiential learning opportunities can be replicated in a virtual environment. In response, students have demonstrated resiliency both personally and academically, through creativity, care for their communities, and continued academic engagement in virtual platforms.

Faculty were called upon to make a rapid transition to a new teaching environment. For many, spring 2020 was the first time that they had taught online courses

and faculty quickly learned the intricacies of learning management systems and online meeting platforms through trial and error or professional development opportunities (Lederman 2020a). Many faculty had to consider new ways to structure their courses to meet student needs, engage students, create equitable learning environments, utilize best practices of online course design, and incorporate cognitive science literature into their online learning environments as the pandemic continued into the 2020–2021 academic year (Garrison et al. 1999; Darby and Lang 2019; National Academies of Sciences, Engineering, and Medicine 2018). Through early teaching experiences and professional development activities, faculty recognized the necessity and opportunity to spend more time considering both course design and student needs. Common curricula challenges included entirely rethinking course structures for field-based courses (Barton 2020), leveraging available technologies to enhance learning (Mukhopadhyay et al. 2020), finding ways to adapt course content to make it relevant to the pandemic (Joy and Price 2020), and minimizing online cheating (Lancaster and Cotarlan 2021). At the same time, faculty were also tasked with considering how to build community in online environments (Freedman and Voelker-Morris 2020), develop trust and rapport with their students (Cavanagh et al. 2018), and create equitable learning environments to meet the multitude of diverse needs and student circumstances (Castelli and Sarvary 2021; Reinholz et al. 2020).

Collectively faculty, administration, staff, and North American institutions have responded to the massive challenge with innovative programming, courses, and experiences to continue to provide students with engaged learning experiences (Theobold et al. 2020; Freeman et al. 2014). Institutions have provided faculty with professional development to respond to the new teaching situations and provide much-needed support for the rapid adoption (Bathgate et al. 2019). Professional networks have bridged the gaps of institutional support to share resources and experiences. Universities have also discovered new ways to support faculty and students through such measures as reduced service or teaching requirements, offering free online textbooks, and ensuring compliance with accommodations for students with disabilities. Faculty have learned to build community in online environments, create meaningful assignments and assessments, and build flexibility into their course structures. Students have responded to new offerings by participating in global cross-campus programs, mentoring peers, and welcoming new students to the virtual campus. Many of these innovations were born out of necessity, but will set the stage for the future post-pandemic phase of higher education in North America.

In this chapter, we present 15 case studies which explore Student and Faculty resiliency and innovation in the face of the pandemic (Table 7.1). We describe ways that students have stepped into leadership roles, have experienced new ways to connect with student peers globally and locally, and found meaningful ways to engage with people in the local community. We demonstrate the innovations that faculty have brought to the classroom as they've expanded their capacity to build accessibility, flexibility, and community into their online classes, which has strengthened the educational offerings. The pandemic has caused North American higher education to consider the ways in which we create more high-impact college experiences for students that do not solely rely on stereotypical college social experiences,

Table 7.1 Themes in the case studies presented

Case study	Key elements in case supporting resiliency
Student resiliency	
Students as Peer Instructors	Course-Based Experiences Active Learning Collaboration Communication Skills Diversity, Equity, and Inclusion Leadership Development Leveraging Technology Teaching Adaptation Workforce Development
APRU Virtual Student Exchange	Course-Based Experiences Communication Skills Community Building Diversity, Equity, and Inclusion Global Cultural Competency Leveraging Technology
Student Resource Guide to Success in Online Learning	Course-Based Experiences Active Learning Leveraging Technology
Quarantunes	Experiential Education Collaboration Creativity Mental Well-being
Connecting Students Through Online Games	Experiential Education Collaboration Community Building Creativity Leadership Development Leveraging Technology Mental Well-being Service Learning
Engaging Global Student Projects	Experiential Education Active Learning Collaboration Creativity Global Cultural Competency Leadership Development Leveraging Technology Teaching Adaptation Workforce Development

(continued)

Table 7.1 (continued)

Case study	Key elements in case supporting resiliency
Global Leadership Challenge	Experiential Education Collaboration Communication Skills Community Partnerships Creativity Diversity, Equity, and Inclusion Global Cultural Competency Leadership Development Leveraging Technology Service Learning
Corona Corps	Experiential Education Communication Skills Community Partnerships Global Cultural Competency Leadership Development Service Learning Workforce Development
Orientation at USC	Experiential Education Community Building Creativity Leveraging Technology
Learning Communities	Experiential Education Academic Learning Community Collaboration Communication Skills Community Building Creativity Leadership Development Leveraging Technology Mental Well-being Service Learning
Faculty resiliency	
APRU Teaching in Virtual Environments	Active Learning Collaboration Community Building Diversity, Equity, and Inclusion Global Cultural Competency Leveraging Technology Professional Development Teaching Adaptation
Virtual Faculty Exchange with University of Indonesia	Collaboration Diversity, Equity, and Inclusion Global Cultural Competency Leveraging Technology Professional Development

(continued)

Table 7.1 (continued)

Case study	Key elements in case supporting resiliency
Large Classes—Engaging Students and Transitioning Online	Active Learning Collaboration Community Building Diversity, Equity, and Inclusion Leveraging Technology Mental Well-being Teaching Adaptation
Lightboard Technology	Active Learning Leveraging Technology Teaching Adaptation
55 Word Stories	Creativity Mental Well-being

such as sporting events and Greek Life parties. It has also exposed deep inequalities in North American higher education and provided us with opportunities to innovate opportunities for offering programs to support a greater diversity of our student populations in a more equitable learning environment. In the cases, we consider the application of these lessons for the future of higher education in North America.

As seen in Table 7.1, across the 15 case studies, we identified 17 recuring themes: academic learning communities, active learning, collaboration, communication skills, community building, community partnerships, creativity, diversity, equity, and inclusion, global cultural competency, leadership development, leveraging technology, mental well-being, professional development, teaching adaptation, and workforce development.

7.2 Case Studies

7.2.1 Student Resiliency Case Studies

7.2.1.1 Course-Based Experiences

Students as Peer Instructors

Learning introductory biology can be challenging for students. Students must simultaneously learn new terminology and how to apply it to processes in living organisms. Mark Carrier, Senior Instructor II of Biology at the University of Oregon, who teaches the second term of an introductory biology sequence, has found that he can reach students in his large 360-person class by engaging a team of Biology Undergraduate Learning Assistants (BULAs). BULAs are students who have previously taken the course and are committed to helping their peers learn the complexities of biology.

Each term, Carrier mentors between 20 and 30 BULAs to assist with his class. They aim to build a strong rapport with students. In the transition to online learning, Carrier found a new way to engage his learning team in the course by asking BULAs to design videos on topics that students find the most challenging. BULAs designed the videos to use everyday language to reduce the need to understand the disciplinary jargon in order to learn the primary concepts. The course relies on examples from new primary literature to illustrate the concepts and as the basis for problem-solving activities. BULAs immerse themselves in understanding the science from the primary literature so they can help their peers understand the concepts. In the rapid shift to online learning, BULAs mobilized quickly to create new resources for the course, create Zoom meeting rooms to replace help sessions normally held in person, and connect with students through the Discord app and course learning management system (LMS). The BULAs can sometimes reach students in a way that graduate students or faculty cannot both due to proximity in age and the recentness of taking the course themselves. Carrier reports that when a student is struggling in the online course, having a large team is beneficial because a student can get help from multiple people who each provide different explanations about the complex topics.

Especially during the pandemic, Carrier is committed to creating an inclusive, equitable, and diverse teaching team. Students are recruited to ensure that the racial, ethnic, and gender diversity of the BULA team mirrors the student diversity. In considering equity, many students who cannot work due to hiring freezes or business closures due to the pandemic could be hired as part of the paid teaching team to make up for possible lost income. Unlike an off-campus job unrelated to their course of study, their position as a BULA also doubles as a form of experiential education which has been able to continue uninterrupted during the pandemic. Carrier found that switching to all online teaching was difficult. However, the benefits of engaging the BULA teaching team in an online environment to provide daily help sessions for students and create timely and accessible videos will continue after the course returns to the classroom. Other universities may be able to adapt this model in the future without offering paid positions but instead providing course or practicum credit to students.

APRU Virtual Student Exchange

International education is critical to students' success in the twenty-first century. The benefits are numerous, including encouraging personal growth and self-discovery, developing intercultural communication and leadership skills, accelerating foreign language fluency, and bridging cultural gaps and broadening world views. But keeping students safe is a priority, which meant prohibiting in-person international exchange programs at the start of the pandemic. Navigating the opportunities to provide virtual exchange took a lot of creative thinking and planning. The Association of Pacific Rim Universities (APRU), a network of 58 leading universities in the Asia–Pacific, organized an exchange program to help facilitate international educational initiatives through its Virtual Student Exchange Program (VSE). This

immersive virtual student exchange experience achieved through digital technologies and platforms allowed students to connect with peers from around the world to learn new knowledge and skills, exchange ideas and cultures, and develop and expand connections and networks.

The APRU VSE Program, led by The Chinese University of Hong Kong, made international education accessible to college students at universities in the United States, and many other countries around the region, despite the pandemic. It had two main components. First, undergraduate students could enroll in academic courses remotely at other participating universities for the same tuition that was paid at their home institutions. No additional fees were required and 78 credit-bearing courses were available in the first semester and a total of 229 academic courses offered as of March 2021. Academic credits can be transferred to the home university, subject to home university approval. The pilot program was started in August 2020 with remarkable success, featuring 26 participating universities in 14 economies and 1100 applications from students within the first five months.

Second, co-curricular programs were offered by participating universities that focused on short, cultural immersion through social connection without the need to leave home. It helped to create encounters for students to share ideas and learn about each other's cultures in four categories cultural, leadership, career, and social. The programs were offered by nine APRU member universities in the first five months, bringing students from across the network in 14 economies of the Pacific Rim at no cost.

A total of 28 co-curricular courses were offered in 2020 which attracted over 400 participants, with many more were planned for 2021. For example, co-curricular course offerings included:

- **Latitude Zero Talks**: **Explore Galápagos** was offered by Universidad San Francisco de Quito (USFQ). In this three-part series, students heard from USFQ experts to gain a deeper understanding of the Galápagos Islands and Ecuadorian culture while exploring what sustainable development looks like in one of the most unique ecosystems on earth.
- **Picturing Hong Kong through Historical Paintings and Photos** was offered by The Chinese University of Hong Kong. Paintings by classical Chinese painters and colored slides by sojourning American military officers were discussed, focusing on different perspectives of this port-turned-metropolis.
- **Living in the United States and Studying at an American Research University**, a series of 10 workshops was offered by University of California, Riverside. Students learned about the American university system, behaviors and expectations in the classroom, employment options and career development, leadership opportunities and collaboration on campus, the basics of American culture and adjusting to new cultural environments, and other useful information to help them be successful when they study in the United States.
- **Halal, Is It the Gateway to Win 1 Billion's Muslim Heart?** was offered by Universitas Indonesia. As a country with the most populous Moslem society, Indonesia has a big concern over the halal-ness of every aspect in their life. But

what exactly halal is? What activities or things that are governed with the rule of halal?

- **Mapathon@HKUST** was offered by The Hong Kong University of Science and Technology. This event provided the opportunity for students to digitally connect and map the most vulnerable places in the developing world so that locals and international non-governmental organizations (INGOs) can use these maps and data to better respond to crises affecting these areas.
- **Black Lives Matter: Global Perspectives: Contextualizing BLM in the History of Slavery & Segregation** was offered by University of California, Los Angeles. This series aims to provide a platform for scholars, students, and activists to deepen their collective understanding of the structure and experience of racial oppression and the long struggle for racial justice, as well as to draw connections among unique, but interlinked anti-racist struggles in the context of global histories of colonialism, imperialism, and internationalism.

Students reported that the experience was very positive for engagement with a different educational system, interesting content, and language exposure. For example, here are some quotes from the student evaluations:

> *it was overall a great experience to get in touch with other cultures and get comfortable with another language, while also studying and learning about topics we're interested in*
>
> *The course was so different from what I'm used to; it was more complete and it really encouraged me to learn and study. The lectures were amazing, and the discussion sessions as well. The material was super complete and extensive, which I really appreciate.*
>
> *The guest university was in contact with us and taught us how to use their platforms. The professor from the class [I] took was interested in our education and made us feel comfortable to speak a second language.*

These types of experiences help improve equitable access to a multicultural learning environment, promoting self-discovery and allowing students to develop and hone skills in foreign languages and cultural competency. These skills will likely benefit them in their future careers. Future VSE programs will enable more students who, for a variety of reasons, might not be able to travel on a full semester study abroad program, to have these types of enriching cross-cultural experiences.

Student Resource Guide to Success in Online Learning

As the University of Oregon headed in Fall 2020, it became clear that students had many questions about how to successfully navigate a fully online and remote courses. The university shared concerns that students might need additional resources in this new learning format. As a result, the university president's office funded the creation of a fully online asynchronous guide for students about online learning.

One of the authors created the content based on topics students encounter in online and remote learning. The site included evidence-based practices and practical applications divided into ten modules: creating goals, time management, online

learning practices, cognitive science principles of learning effectively, note taking, active reading, test preparation, increasing motivation and reducing procrastination, tests taking and reducing anxiety, finding appropriate resources, and creating study plans for finals (National Academies of Sciences, Engineering, and Medicine 2018; Brown et al. 2014). Each module was designed with attention to accessibility and best practices for online instructional design. Modules included learning objectives, key information and resources drawn from literature and presented in text and videos, questions to prompt student reflection, suggestions for student action, and two or three knowledge test questions. The main content and videos emulated experiences student would have during office hours discussing online study skills and strategies.

The resource was designed to meet the short-term, immediate needs of students as they transitioned to online learning. However, the learning skills content, reflections, and actions are applicable in all learning environments. Furthermore, by providing opportunities for students to assess their academic strengths and challenges, students can work on further developing their strengths to help them through difficult experiences beyond the pandemic.

7.2.1.2 Experiential Education (Out-of-Classroom Experiences)

Quarantunes

To bring international university students together by sparking creativity and sharing positivity during the pandemic, APRU created the Quarantunes competition (APRU 2020). With anxiety prevalent across universities worldwide, APRU wanted to give students a new way to cope with isolation and work with peers to produce musical works that spread positivity. Students were tasked with the challenge of working in teams to create a song of a maximum of three-minutes to inspire hope. The competition was conceived as a way to use artistic expression to foster creativity and discussion around the importance of mental wellness during a challenging time. Each of the students' songs tells a unique COVID story that helps us see beyond the current difficulties to inspire resiliency and hope for the future.

The competition attracted an impressive 108 entries by over 400 students from 24 universities in 13 economies across the Asia–Pacific. The songs reflected an incredible breadth of international student talent. The winners were selected by popular vote, through Facebook and an online voting system. First place winners received US$2,500 while the others received prizes of US$1,000. The two winning entries were submitted by student teams in Hong Kong/Taiwan (song titled "Get Down"), and México (titled "*Somos Más*"). Teams from the Philippines, Colombia, the United States, and South Korea also received prizes.

Fig. 7.1 The USC University Park campus in *Minecraft* (Picture Courtesy of Alastair Morrison)

Connecting Students Through Online Games

How do you build community among students remotely? The pandemic meant that most students would not be on campus. Here we describe innovative online gaming collaborations that have arisen to connect students across an individual campus, across the United States, and globally through the APRU network and through necessity have developed student leaders.

A group of University of Southern California (USC) students built the campus in the online game *Minecraft*. The game revolves around building expansive virtual worlds by gathering building supplies, like wood, stone, and brick (Lindberg 2020). The students spent days working together to create a realistic version of the USC campus one brick at a time, using reference photos and satellite images from Google Earth (Fig. 7.1). Iconic campus statues and landmarks were incorporated, including a sword-wielding Tommy Trojan in the center of campus. Visiting students could even enter some of the buildings, which were created by memory by the students. Once built, players could enter the virtual campus and interact with other players, helping to connect students who have never officially met. It has also helped incoming students get a feel for navigating campus. The program was so successful that it will continue to provide another way to connect incoming students to campus even once students have returned to in-person learning.

Online gaming provides an attractive way for students to connect outside of the classroom. USC Games is Princeton Review's top-ranked game design program in North America and represents an exciting, ongoing collaboration between the School of Cinematic Arts' Interactive Media & Games Division and the Viterbi School of Engineering's Department of Computer Science. It offers four degree programs for both undergraduate and graduate students in distinct areas of game design and management, with plans to expand their offerings over the next year. "*COVID-19*

presented private and public organizations and institutions with unprecedented challenges that many of us had to adapt to in 'real time,'" said Jim Huntley, Professor, USC Games Program, Faculty Adviser and Head of Marketing for USC Games, "*and with all of that disruption going on, the fact that the quality of our instruction hasn't been deleteriously effected is a testament to our program's students, staff and faculty*" (https://www.cs.usc.edu/).

Another initiative created primarily in response to the pandemic, the "Pac-U," established in 2020, is a collaborative effort by 11 of the universities that make up the Pac-12 "traditional sports" conference across the western United States and their respective Esports organizations. The group provides students a modern virtual approach of generating school spirit remotely, through non-physical form of collegiate competition. The Pac-U offers students the opportunity to experience the camaraderie, fanship, and rivalries often attributed to physical collegiate sports in a new way and through a safe digital arena which is lacking for most students through remote learning. The ultimate goal of the Pac-U network is to build a national network of colleges that engage in Esports and establish gaming as a key component of student life. The Pac-U has organized events such as digital conferences and several competitions in which student representatives from each member university Esports teams can continue to play from the safety of their homes. These events also help to establish connections across schools, and ultimately, learn from each other's practices in the competitive gaming industry. For those who aren't interested in the role of a player, positions, such as Technical Director, Competitive Administrator, Producer, Caster, Observer, Graphics Operator, offer students the opportunity to learn and grow skills that could benefit them in their future careers but also personally. In these roles, students learned how to create professional-looking broadcasts within an evolving hub of collegiate Esports. But this program offered the opportunity to be part of a community of students who share similar passions. Long-term, more universities might look to Esports as a way to use a fun, interactive way for students to connect outside of the classroom and learn skills that they'll need to master in order to be a part of tomorrow's gaming industry and consider new ways to build community for students even when they cannot be on campus.

Another new initiative is the Association of Pacific Rim Universities' (APRU) Esports Fellowship, led by Tecnológico de Monterrey and in partnership with Cyberport (Hong Kong). Universities play a pivotal role in developing the vibrant growth of the Esports industry. The global Esports market was valued at over US$1.1 billion in 2019 and is expected to grow to close to $7 billion by 2027 (Esports Market Analysis Report 2020). Fueled by rising popularity of multi-player video games, improved technological infrastructure and mobile phone access in developing countries, and increasing awareness of Esports, this form of competitive gaming is more popular than ever. League tournaments are also on the rise, along with the growth in viewership and audience engagement sparked by the pandemic. More and more universities are now organizing Esports programs and even degree courses (Ravi 2020).

The Fellowship Program aimed to cultivate an international network of student leaders engaged in a next-generation learning experiences. This one-year-long program provides students from seven universities with support to grow the Esports

community at their universities. Over a period of one year, students engage in bi-weekly workshops and activities, gain direct access to industry leaders and partners, and gain skills necessary to lead in the future of the Esports industry. The program fosters talent to not only become skilled Esports gamers but Esports professionals. The program also aims to pave the way for a stable, ethical, and diverse industry. Through collaborative research, universities will also explore the psychological impact of gaming and Esports, helping to identify potential ways to prevent addiction and to reduce violence and gender-based harm often associated with gaming. In addition, research is also exploring the therapeutic effects of gaming and its potential for positive impact. For example, the University of California at San Diego has a lab that is working on ways gaming can benefit people with autism (Ravi 2020). These creative mechanisms for providing students with opportunities to engage outside of the classroom during the pandemic will continue to enrich students' university experiences even after students have returned to campus.

Engaging Global Student Projects

The Virtual Business Professional Project is a six-week project developed by USC Marshall School of Business that focuses on global business communication skills (https://www.marshall.usc.edu/departments/business-communication/vbp-project). The objective is to provide a platform for students to build cross-cultural and virtual literacy through a team-based competition relating to the social media presence of a major multi-national corporation. Begun in 2013 with three participating universities, about 100 teams from 15 universities in eight countries in Asia, Europe, and North America participate each year. Students work in international teams of 5–6 students, with no teams having more than one student from the same university. To develop competencies around global collaboration, teams participate in several team-building tasks, including scheduling face-to-face virtual meetings, negotiating team roles, developing meetings agendas and minutes, and scheduling regular meetings across time zones. Each of these meetings is tracked and has specific deliverables as part of the project.

Over six weeks, students work virtually to investigate the social media presence of a multi-national corporation, such as Amazon, Google, Netflix, Audi, and Starbucks. Teams then develop a report with set of recommendations on what steps the company should take next to improve its online communications. The faculty collaboratively select the top 10 finalists, which are sent to the partner companies for their review and a winning proposal is selected by the partner corporation. Teams receive valuable feedback from corporate executives with specific input on their report, including strengths and weaknesses.

This innovative project is offered for free to all interested universities to provide students an interactive way to develop global collaboration skills. While students don't receive academic credit for participating in the project itself, the experience is frequently included in courses as a major assignment. The core instructors who lead the course rotate to share the enormous time commitment and workload.

After universities began closing two weeks into the course in 2020, students reported feeling a sense of continuity and normalcy through participation. It helped students realize that all team members around the world were experiencing the same unsettling and stressful experiences. One professor explained, "*Many [students] felt that the virtual team communication and the global VBP project in fact helped them in the disruption by offering continuity and some stability – or almost comfort since all team members around the world were experiencing the same chaos*" (Cardon 2020).

Because no team members are co-located at the same university, they must rely entirely on online communication tools for communication and collaboration. As one student said, "*My VBP teammates are scattered around the world so every time we get together via Zoom we talk about what's happening in the country/state we're in and update each other on current events and our living situation. In a way, it's almost like having pen pals and that to me is so exciting.*" One student who is now working in global marketing at Google said she developed the skills she uses in her job every day through this course. She now serves as a team sponsor because of the value she found in the experience (Cardon 2020).

Through this experience, students experience working in global teams, including learning about organizational behavior, cross-cultural collaboration, and the team life cycle. In students' course evaluations, they consistently reported increased compassion and concern for their teammates. One student from put it this way, "*COVID has really been so inconvenient with this project. It really is a good metaphor for life. Compassion and understanding can go a long way, probably especially in the business world. Specific communication takes a whole new meaning when working with different time zones and people we've never met*" (Cardon 2020).

Global Leadership Challenge

Collaborative global student projects can also have positive impacts on students across a shorter time scale. In 2019 the University of Oregon hosted an APRU Undergraduate Leadership Challenge for student leaders nominated by their university. Students developed skills of leadership, communication, and global education while working with a small team to develop innovative solutions to environmental, public health, and social inequality challenges faced by organizations located near the University of Oregon. According to program director, Grace Honeywell, students reported that the opportunity to work on a real-life problem while building peer relationships was life changing.

In 2020, the UO modeled a new Global Leadership Challenge on the APRU Program (https://international.uoregon.edu/global-leadership-challenges-new-homepage). Based on sustainability challenges, students developed solutions for local government, business, and non-governmental organizations. When it became clear that international travel would be impossible in summer 2020, the program quickly had to pivot to a fully online offering. Honeywell admits that she and other leaders were concerned about creating an online environment that was equally as rich and

rewarding for students in person. Would students be able to build innovative solutions while attending sessions both asynchronously and synchronously and working remotely with teammates across wide geographic areas and multiple time zones? Would the project solutions be as strong? Would students stay engaged? Students adapted easily to the online learning environment, engaged deeply with their sustainability partners, and like the USC Virtual Business Project developed strong global peer relationships in the two-week remote program.

In their final presentations, students developed solutions that were equally as innovative as the previous cohort of in-person learners. Students reported that participating in the Global Leadership Challenge provided a much-needed opportunity during the pandemic to meaningfully engage in real-life solution generation, collaborate with peers, and learn new skills applicable beyond their academic coursework. The opportunity to interact globally through virtual team projects provides an important intercultural learning for students. While students missed out on the experiences of traveling to a new location and working in person with peers, due to the elimination of travel costs, this type of program can continue to be more accessible to a wider range of students who are unable to travel internationally for a multi-week program and can still have an international experience at home. Additionally, the opportunity to work on a real-life solution to a real challenge was invigorating to students in a time when many students felt unable to impact the global pandemic.

Corona Corps

The University of Oregon, in partnership with the local public health authority (Lane County Public Health) and state leadership in the Oregon Health Authority, created the Corona Corps in June 2020 to harness student skill and energy to expand public health response to the pandemic. A comprehensive public health strategy with a well-trained workforce is key to protecting lives and livelihoods now and in the future. To create an integrative learning experiential education for students, COVID containment work was embedded in curricular experience designed to train the next generation of public health professionals (Roberts 2015). The Corona Corps students could receive academic credits by participating in a learning community for students with regional, national, and global participants, which was also included as an APRU Virtual Student Exchange co-curricular opportunity.

The Corona Corps co-Directors Jeffrey Measelle, Professor of Psychology and faculty in the Global Health Program and Angela Long, University Health Center Director of Health Initiatives describe how the corps has energized and invested in students, who are an eager labor force for contact tracing, case management, and case investigation of the coronavirus. Students have been able to be part of a flexible workforce model with multiple forms of meaningful compensation (pay, credits, mentorship). Students are trained with extensive hands-on observation and on-the-job-training. The corps was easily able to surge and contract based on local public health needs in response to pandemic and has been able to expand more easily than in other localities where public health agencies relied on furloughed workers

or community volunteers. The corps is directed by faculty and health center staff which leverages the professional assets of these committed educators and allows the university to be directly engaged in the community pandemic solution. Additionally, the corps has developed a constructive partnership with local public health authorities. A student public health corps can be activated for future crisis such as natural disasters to continue to maintain community-university relationships and provide ongoing experiential education opportunities for students.

Orientation at USC

To make students feel welcomed and part of the university community, the Orientation Office at USC held "Explore LA" virtual tours (Explore LA 2020). Students were invited to discover how USC and the city of Los Angeles pivoted to offer many of virtual activities. Advisors provided information on virtual events hosted by USC student organizations and staff, including virtual workout classes, paint nights, concerts, and virtual events offered by local museums and virtual tours, such as:

1. **Historic Neighborhoods**: Ever wondered how Los Angeles came to be the vibrant and diverse city it is today? Join us for a virtual tour of historic neighborhoods that make Los Angeles the unique melting pot of rich history and culture it is today. Learn about local neighborhoods including South Central Los Angeles, Lincoln Heights, Hollywood, and more. Explore the city by learning about cultural landmarks and get a first glimpse of the sights and flavors that make Los Angeles one of the most culturally diverse places in the world!
2. **Entertainment & Hollywood**: Lights, Cameras, ACTION—Los Angeles has it all! Join us for a thrilling presentation showcasing Los Angeles' most popular entertainment hubs! We'll be sharing some of our favorite concert venues, studio tours, amusement parks, and more! Current students and professors in the entertainment industry will share their experiences in one of the biggest entertainment capitals in the world.
3. **SoCal Scenery & Landmarks**: Los Angeles is known as a sprawling metropolis full of busy, vibrant city life, nestled in the beautiful landscape of Southern California. Join us for a short presentation as we introduce you to some of the many wonderful hiking trails and beautiful landmarks in the Greater LA area. Hear from Orientation Advisors and USC student organizations that center their activities around the breathtaking outdoor spaces and activities that Los Angeles and its surrounding areas have to offer.

The series provided an opportunity for students to link to the geographic location of the university, as well as to the campus community without being present in Los Angeles. This helped students feel a sense of connection and belonging to the USC "Trojan Family." In the future, these online tours can help new students understand the city and region before moving to USC.

Fig. 7.2 Description of Academic Societies logos

Learning Communities

The Tecnológico de Monterrey School of Medicine and Health Sciences (Escuela de Medicina y Ciencias de la Salud) has developed an innovative initiative to improve student follow-up and communication by providing a mentorship program embedded in the medical school curriculum. Based on the Learning Communities Institute (LCI) model, the Academic Societies Program was created in 2013. Each of the Academic Societies is comprised of about 180 students from multiple disciplines, including medical, dentistry, clinical psychology, biosciences, and nutrition. Each group also is assigned one faculty leader and a set of about 15 faculty mentors.

The School of Medicine has presence in four different cities across México: Monterrey, México City, Guadalajara, and Chihuahua, each of which has its own Academic Society to help support students over the six-years of medical and health sciences curricula. The main objectives of the Academic Societies are:

- Support the academic and professional growth of its students through learning communities.
- Stimulate knowledge, personal growth, and collegiality among students.
- Facilitate constant communication and support between students and faculty.
- Offer personal and professional guidance to students.
- Provide a safe space for integration, wellness, and health.
- Establish a network and community of practice once students leave the program.

As seen in Fig. 7.2, there are nine Academic Societies, each named after a character strength identified by Peterson and Seligman (2004). A character strength can be defined as positive trait reflected in thoughts, feelings, and behaviors. To evoke the underpinnings of medical tradition, their official names were translated to Latin. To increase solidarity, each Academic Society also has a color, name, and animal: wolf (Humanity), lion (Courage), deer (Fidelity), eagle (Justice), elephant (Prudence), bear (Wisdom and knowledge), bull (Temperance), horse (Transcendence), and owl (Truth).

The motto and central mindset, "*Nemo Resideo,*" means in Latin "Leave no one behind". The most important pillar of Academic Societies is the sense of community belonging among both students and faculty. A broad variety of activities are

available for students. One popular program is a mentoring and follow-up program where senior students mentor junior students throughout their entire program. The mentors and faculty leader are in close contact with students to provide advice on academic, health, and other issues, by capitalizing on the strong support system within their learning community, as well as the larger university as a whole. The sense of belonging and identity is also promoted through a year-long competition among the nine Academic Societies that consists of multiple challenges relating to sports, academics, fine arts, social gatherings, etc. The competition fosters healthy rivalry and encourages students to actively engage with others within their Academic Society. Other major events organized around the Academic Societies include: a White Coat Ceremony, yearly Colloquium, and Graduation Ceremony. The ultimate goal is for students to thrive in their academic community and eventually form part of a community of practice, by providing them with professional, disciplinary, and emotional tools that will serve them well in the future.

The COVID-19 pandemic initially disrupted the Academic Societies' activities, which depended mainly on face-to-face, on-site communication. Faculty and students had to find a way to keep building community at a distance during a time of great emotional need. With this in mind, new activities and initiatives were designed to keep the community alive in a virtual way. Some of the newly designed activities included frequent online tutoring and counseling sessions for students, both individually and in small groups and an online safe space for sharing knowledge and finding support, and entertainment through virtual escape rooms and online games. Additionally, each Academic Society capitalized on the use of social networks to bring students closer together. An example is the "quarantine challenge" via Instagram, in which students and faculty posted a different small challenge every day. Short workshops were also led by students based on their individual talents or abilities, such as photography, yoga, origami. These opportunities provided fun ways for students to remain connected, even while off campus.

Communication is key to establish an online community. In México, WhatsApp is an important social network tool commonly used by all age groups. Each Academic Society has its own WhatsApp group chat, which was used during the pandemic by faculty to disseminate information to keep students safe or share other important announcements. Through this chat, students have been able to ask for help in many areas, including academics, health, and personal well-being. Having notifications sent directly to everyone's personal devices was not only convenient but was more efficient than email, which students did not frequently read. This has proven to be an effective communication method to guarantee that information flows to students and back to mentors.

Another important task for the Academic Societies was to find ways to help society members during the challenging and stressful times. At the beginning of the pandemic, students were sent home for their own safety and to prioritize the provision of resources like personal protective equipment to frontline health workers. Academic Societies often nourish students' sense of purpose, which is paramount in young health professionals' development. The Tecnológico de Monterrey coordinators created a program called "Take Care of Your Body and Mind: Virtual

Counseling." Approximately 450 students in their final semesters of study were called upon to support the general population via telephone, text chat, or videocalls regarding COVID-19 concerns such as: what to do in case of symptoms, stress reduction techniques, and healthy habits. About 80 faculty volunteers supervised patient encounters.

Additionally, a program called "Pandemis" was created to raise awareness about COVID-19 through social media. The purpose was to share facts about COVID-19, how to identify fake news, and to promote prevention measures. Medical students from Academic Societies in their clinical rotations were responsible for the project, while receiving guidance from faculty mentors. Students shared COVID-19 information according to their clinical rotation. For example, those in pediatrics promoted information regarding COVID-19 in children. Within each rotation, students were divided into three groups with different tasks: (1) research, (2) visual material design (infographics, videos, social media posts), and (3) social media management. It proved to be an efficient way to reach the community and raise awareness through accurate information about the pandemic. Several social media platforms were used, including Facebook, Twitter, and Instagram. The program had a total of more than 3,000 followers, more than 500 posts, and an estimated reach of 60,000 people, all in the first six months of the pandemic. Collectively the Academic Societies have maintained connection with students that will continue to be important as students re-enter university life and the new, unknown challenges that will bring forward.

7.2.1.3 Faculty Resiliency Case Studies

APRU Teaching in Virtual Environments Workshops

In recognition that our global colleagues within the APRU network were facing similar, sudden remote and online teaching challenges during the coronavirus pandemic and individual institutions may not have been able to meet the demand for faculty professional development, the authors launched an online series on Teaching in Virtual Environments webinars co-sponsored by the APRU Global Health Program and University of Oregon, Global STEM Education Program (Withers et al. 2021). We advertised these as guided, casual Zoom chats with faculty experts. Each session was designed so participants could talk about teaching innovations and challenges during the transition to online and remote teaching and learning environments. We had four goals in launching the series:

1. Create space where APRU affiliated faculty could connect to share resources and experience with teaching in remote settings.
2. Provide pedagogical, technology, and peer support to faculty across the APRU network who are likely facing similar remote teaching challenges.
3. Build community for faculty across the APRU network during this time when we cannot gather in person.
4. Support and complement other APRU Global Health Program events.

In each of the 90-min sessions, we invited faculty experts from two APRU member universities to share brief comments and evidence-based practices that inform their teaching design decisions. Faculty experts shared suggestions for modifications they had made to their teaching for the short-term transition to remote learning and simultaneously reflected on application of lessons learned to future remote or in person instruction. After the expert mini-lectures and reflection, participants had discussion in smaller breakout rooms followed by a larger group reflection. In each session, we modeled evidence-based teaching practices by providing breakout rooms prompts, demonstrating polling software for formative feedback, and creating an inclusive environment where all voices were welcomed and encouraged to participate. The session topics that were identified by the organizers and amended by participant requests included assessment, experiential education, building community, technology, equity, support beyond the classroom, active learning, and supporting diverse student populations.

For example, in a session on *Creative Ideas for Online and Remote Assessment* our experts presented information about and experience with implementing evidence-based assessment practices to improve student learning. Presenters shared specific examples from their courses which attendees could adapt to their own online and remote teaching:

1. **Two-part exams** in which part 1 is finished independently in class and part 2 outside of class and/or with a group to provide students with more opportunities to reflect and learn during high stakes assessments (Wieman et al. 2014).
2. **Public exams** in which faculty provide students with a portion of the exam in advance such as question stems but not multiple-choice responses or a figure for interpretation without associated questions. Public exams ensure assessments are aligned to course learning objectives, improve student metacognition, and reduce test taking anxiety. Exams include higher order cognitive question to assess students' critical thinking skills (Wiggins 2019).
3. **Multiple-True–False Questions** in which students answer a series of True/False questions on one figure, image, or case study (Fig. 7.3). Answering interrelated questions helps identify student misconceptions or instances where students hold simultaneously conflicting understandings of the content (Brassil and Couch 2019; Couch et al. 2015).
4. **Two-Tiered Multiple Choice Questions** in which there are two sets of questions based on one image or case study. The first question assesses basic understanding and the second question assesses higher order critical thinking (Dirks et al. 2014).
5. **Exam Wrappers** include pre-exam questions for students to reflect on their preparation and confidence. Often paired with a post-exam wrapper for reflection on study strategies, missed questions (e.g., didn't study enough, forgot material, etc.), and future exam preparation (Lovett 2013).
6. **Take-Home Exams** for problem-solving exams which have the benefit of reducing stress for students and increasing the opportunity to assess higher order cognitive critical thinking and reduce reliance on technology for assessment (Bengtsson 2019).

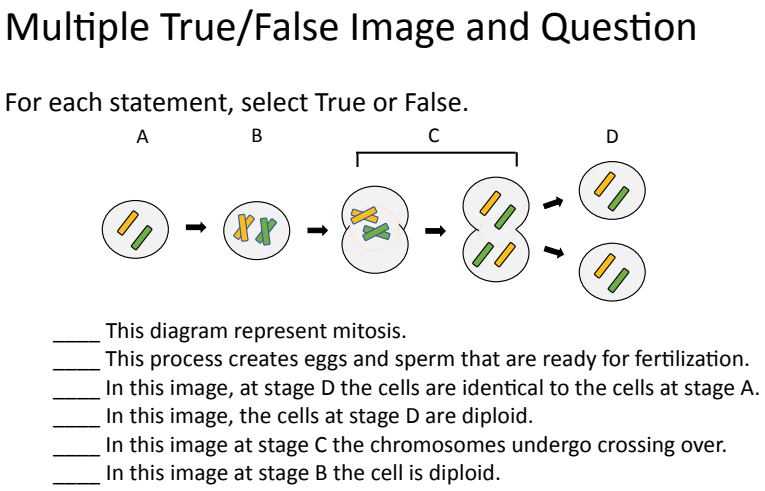


Fig. 7.3 Exam includes an image about cell division and students answered six separate True/False questions to identify concepts that students did not yet understand (Image courtesy of Eleanor Vandegrift)

7. **Challenges with academic integrity, technology, and equity** which were raised but not addressed in detail during this session, but became the basis for two future sessions.

Breakout rooms provided a structure for group discussion. Participants introduced themselves and then selected group roles as timekeeper, reporter for the main group discussion, recorder to write down group ideas, and discussion leader (Yezierski et al. 2008). During the assessment session participants had four questions prompts to spark conversation:

1. Which of the ideas presented could you implement in your courses?
2. What other ideas do you have for assessing your students' knowledge?
3. What concerns do you have about cheating?
4. What other types of lower stakes assessments might you like to try?

In many of the sessions, we heard repeated themes that faculty were learning and trying new skills as were their students, concerns about equity and access, parallels of experiences across very different academic institutions and geographic locations, and application to in-person instruction. Faculty needed the support, both pedagogical and peer, to build their resiliency to take on these new challenges. Appreciating that colleagues at other institutions and other countries are facing similar challenges began to establish a community of practice (Laksov et al. 2008; Wenger et al. 2002). As we move beyond the pandemic, these connections faculty have developed can help sustain future teaching innovations.

Virtual Faculty Exchange with University of Indonesia

Recognizing the many benefits of cross-cultural exchanges, the University of Indonesia (UI) created an innovative solution to continue to host visiting faculty from universities in North America and around the world during the pandemic. Normally, international exchange activities at UI are offered for both students and faculty, through both inbound and outbound programs. In the inbound program, the university hosts international students or faculties who want to spend time attending classes or teaching or doing research for a short term at the university. The university also sends students or faculty for short-term visits at universities abroad in the outbound program. These experiences help to broaden world views and help UI students gain intercultural skills and become global citizens. During the pandemic, the Faculty of Public Health at UI created a virtual inbound program to ensure that UI students could benefit from interactions with international students. Undergraduate and graduate students from Iran, Japan, Nigeria, and Nepal were invited to work with students from UI in virtual teams. Each team was assigned a subdistrict in Indonesia with different of public health problem, such as lack of sanitation, TB, slum housing, industrial waste, the unsafe use of pesticides in agriculture. The groups were required to investigate the causes of the problem and generate strategies to prevent and control the problem in the future.

For faculty, opportunities are generally always available to invite faculty from other universities in other countries to develop new research teams, write joint publications, and conduct collaborative studies. But the program was expanded to invite faculty members from universities in the North American (US and Canada) and around the globe (UK, Australia, Germany, Qatar, India, Taiwan, Hong Kong, Malaysia, Thailand, and Rwanda). Key faculty from each university were invited to be visiting faculty and give two lectures on their research and the COVID-19 pandemic. One of the lectures was intended for students and the other was for faculty to develop new networks and compare experiences across countries. Recognizing the global dimensions of the pandemic, another goal was to provide an opportunity to gain insight into the public health measures and outbreak situation in other countries.

The virtual exchange program allowed for exchanges that would not have been possible in person due to budgetary and time constraints, and other logistical issues. This type of education in a multicultural environment can better prepare students to work abroad or in global teams and post-pandemic the virtual exchanges will allow for more faculty and institutions to build collaborations.

Large Classes—Engaging Students and Transitioning Online

How do you move an entire large introductory biology course online for students who will be participating from around the globe? That was the challenge that faculty, including Robin Young, an Assistant Professor of Teaching at the University of British Columbia, Okanagan campus, faced when preparing to teach her biology courses in Fall of 2020. Fifty percent of enrolled students at her institution are from

British Columbia, 25% are from across Canada, and the other 25% are international students. However, due to travel restrictions many students stayed at their homes of origin rather than living in residence on campus. In preparation for teaching, Young considered the key elements from her in-person course she wanted to maintain to create a positive learning environment for her 500 first-year students and 150 upper-level students. She started with the premise that building community was essential for student success both with synchronous class time and out of class spaces. Additionally, she did not want to give students more work while simultaneously reducing cheating and maintaining an active learning environment she cultivated in person. Along the way as she adapted to the new teaching environment, Young found new teaching strategies that she will continue using in the future in person.

To support building community for students, Young and her colleagues looked for opportunities engage students in familiar online spaces, which included establishing a Discord group for the first-year students. Discord is frequently used in the gaming community and has an easy-to-use interface with a low barrier for adoption. The Discord group has grown to serve at least 700 students with volunteer student moderators helping to keep the online asynchronous conversation positive. Through the app, students formed study groups and created social channels for movies and wellness. Young even built this asynchronous "back channel" into her synchronous lectures where instead of small group in classwork, students could discuss class questions with their Discord study group. Students have created a very strong community, which carries over to the synchronous lecture time. Faculty teaching first-year science courses also created their own private channel to replicate informal faculty hallway conversations. This faculty network was important when students started using Chegg to post homework and exam materials online, and faculty wanted to provide a common response to all first-year students about academic dishonesty.

Young decided to continue providing synchronous lectures that she recorded to enable students who were outside of the local time zone to watch later. The class community became particularly evident through the synchronous chat during live class. Young says, "Chat window is a magical space." Students not only answered content questions, they also typed supportive comments to their peers during class. Going forward, she would like to continue to record lectures and recreate the synchronous chat during class. Young joined class 10 min early each class and students would join for BINGO, Zoom coloring through the annotation tool, or word searches continuing to build community. For a few topics such as evolution, which can elicit strong emotions for students, Young pre-recorded videos for students to watch in private before class coupled with an asynchronous discussion. Young says she will continue to use videos like this in the future as it improved the synchronous class time.

Young already had a course structure that included pre-class work, transparent assignment design (Winkelmes et al. 2019), in-class activities, and post-class work. To keep the workload reasonable for students and reduce stress, Young maintained this structure. For assessments, she included more lower stakes assessments and revamped three shorter, open-book exams with the intention to reduce cheating.

Fig. 7.4 Professor Nix with her homemade lightboard (Photo courtesy of Emily Nix)

Young did not have grading support for the 500 students, so she wrote a lot of interesting multiple-choice questions and learned how to hand-draw biological images that were not easily googled, all of which allowed students to have unique online exams. Young describes that while the rapid transition online was difficult, having a solid course structure, paying attention to building community, and providing students flexibility allowed her to maintain the typical level of content learning. She's looking forward to applying the new pandemic lessons to her in person classroom when conditions allow.

Lightboard Technology at Home

USC economist and assistant professor Emily Nix realized that she would probably be required to begin teaching her Microeconomics for Business course online. She relies heavily on lecturing while writing on the chalkboard to explain the challenging concepts of the course, which include a lot of equations and graphs. She didn't want to completely rebuild the class from scratch to suit an online teaching environment, so looked to the internet for options to support her teaching. That's when she stumbled across the lightboard. It's a simple setup: a sheet of plexiglass surrounded by a wood frame and LED lighting, like a glass chalkboard infused with light. While professional lightboards can run as much as US$8,000, she decided to make one herself for much cheaper. With just a sheet of plexiglass, some wood, mounting brackets, and LED lighting strips from the local hardware store, she was able to create her own in her father's garage for less than US$60 (Fig. 7.4). When Nix drew on the board, her

words and diagrams glow in front of her (Fig. 7.4). She quickly assembled a small prototype and was thrilled with the result. She posted a short video on YouTube and Twitter showing this creation, which has received over 100,000 views (https://youtu.be/RcFyzrSFRMo). After watching her Twitter video, other college professors have sent messages asking how to build the device.

Her lightboard hack is just one strategy Nix has employed to bring energy and innovation to the classroom. She said, "The one thing that totally shocked me [was] I actually had far higher participation this year than I had in previous years" (Esquivel et al. 2020).

Nix' innovation did not end there. She also taught herself how to create short animated introduction videos that grab attention through upbeat music and colorful animations (https://twitter.com/EmilyNix100/status/1283550977409404928). During her live online class sessions, she utilizes several instructional methods to engage students, including speaking to PowerPoint slides, live demonstrations using the lightboard, and her personally created video clips. Her creative problem-solving skills have not only saved thousands of dollars but have provided students with a much better learning experience. Her advice for other teachers is "Think about what you do really well in person, focus on a few small features, and then think about how you could translate it" (Esquivel et al. 2020).

Word Stories

The University of Washington's School of Medicine created "55 Word Stories" for healthcare providers who wanted to share their experiences as healthcare workers during the pandemic. The objective was to increase connectedness and well-being by reading stories from peers, helping to promote solidarity and community, even when isolated. Healthcare providers across all professions and roles (including students) were invited to share short reflections of up to 55 words on a curated website about how the COVID-19 pandemic has impacted them or the practice of medicine. A short set of instructions and helpful tips on how to begin were also posted. As the website described "*The authenticity, compassion, creativity, and bravery of our colleagues helps us to access our own emotions, and helps us to carry on.*"

The project strengthened the community of healthcare providers during an intensely emotional and stressful time (UW Medicine). Over the past year, hundreds of stories have been posted with permission from the authors, although authors could choose to remain anonymous. Reading the words from others who were experiencing similar, often stressful and traumatic, events was cathartic, and helped to reinforce the notion that healthcare providers were not alone. Providing a creative outlet for healthcare workers, including students and faculty, for self-reflection and expression was a valuable healing tool. Themes often revolved around mental health, including expressions of feelings of isolation and loneliness, self-doubt, anxiety and stress, the disappointment of canceled plans. Many reflected on the ways in which patients had been impacted. Other themes included gratitude, hope, and solidarity. Some examples are below (https://faculty.uwmedicine.org/55-word-stories/):

Useless

Zoom. Computer screen. iPad to the side.
Don't forget your blue-blocking lenses.
"Clinical experiences have been suspended
– indefinitely"

Immunosuppressed.
That's probably for the best.

But how can I help?
How can I help if I am stuck behind this screen?
Are we even really a part of things?
It's hard to feel like learning anything.

by Tiffani Lautenslager, Medical Student

open mind

Why fight the ask to wear a mask?
I met a middle aged woman today who had a history of rape and abuse and was triggered by wearing a mask.
And so she put off to the doctor for months.
Couldn't face the anxiety of something covering her face.
But only in the doctor's office could she share her fear and vulnerability.
The rest of the world only sees her anger.

by Lee McKoin, Medical Student

Love in the time of coronavirus

My patients know that I always offer them a hug or touch. Adjusting to coronavirus has been a challenge—but love finds a way!

Recipe for a hug, covid style:
Right foot bump
Left foot bump
Right elbow bump
Left elbow bump
Smile, laugh
Look into each other's eyes
We will get through this

by Jane Hitti, Attending Physician

7.3 Conclusion

Across the case studies, describing examples of how North American colleges and universities have responded to education in the pandemic, we describe ways that students were able to engage in meaningful programming to become global citizens through self-discovery and authentic learning experiences. Indeed, many of the case studies (Students as Peer Instructors, APRU Virtual Student Exchange, Quarantunes, Connecting Students Through Online Games, Engaging Global Student Projects, Global Leadership Challenge, Corona Corps, Learning Communities, Large Classes Engaging Students and Transitioning Online) included high-impact practices, which have been found to improve overall student learning experiences (Kilgo et al. 2015). Across these activities, students engaged in active and collaborative learning, global perspective building through (virtual) study abroad and cross-cultural exchange, service learning, internship-like activities, capstone-type experiences, and academic learning communities (Kuh 2008). These high-impact practices allowed students to have exposure to diverse perspectives and cultural awareness, less formal and more targeted interactions with faculty, integrate their learning beyond the classroom, and contributed to their well-being even from a distance or in virtual settings. Some evidence indicates that the outcomes of high-impact practices are dependent on student participation, institutional structures, and the combination of experiences that students experience in college, but it is evident that "that high-impact practices have an overall positive effect on student learning and development" (Kilgo et al. 2015). Even in an asynchronous or synchronous online learning environment, high-impact practices have a cumulative effect to improve student learning experiences (Linder and Hayes 2018). As universities have experienced during the pandemic, high-impact practices can be integrated into the student experience both in and outside of the traditional academic course experiences. Moving forward, institutions should prioritize creating additional cumulative opportunities for high-impact practices online and in-person. As we see in the case studies, with online experiences, more students have had opportunities to work with global collaborators and virtually visit new places. Capitalizing on available technological platforms in this new digital age can ensure that all students have access to such opportunities, improving equitable learning experiences for all students. Building and leveraging relationships with university partners in other countries can also help universities to share resources and expertise to reduce costs and the workload of providing such experiences.

Many of the case studies also describe opportunities for students to step into leadership roles (Students as Peer Instructors, Connecting Students Through Online Games, Engaging Global Student Projects, Global Leadership Challenge, Corona Corps, Orientation at USC, Learning Communities, Large Class Engaging Students, and Transitioning Online). There is not consensus in the literature about the best educational practices and research principles to use to improve cross-cultural abilities and hireability when designing student leadership programs (Balwant et al. 2019; Priyadarshini et al. 2019; Skalicky et al. 2020). However, to respond quickly to the

pandemic, universities were called upon to support students and build new educational experiences with little time for preparation. While this type of shift would generally require months of planning and consultation with experts and developing a theoretical framework based on the literature around student leadership development, the case studies described successful programs that promoted student engagement and that were developed in record time. As described, these programs met the challenge of providing students with opportunities to participate in civic life, meaningful cross-cultural conversations, and help their peers. Perhaps one lesson for higher education is that if given the opportunity, students will engage and participate in meaningful, life-changing experiences.

The cases also highlight the importance of faculty and administrative structures supporting students beyond the classroom. It was clear that students wanted to build meaningful connections with others, despite not being together in person in a classroom setting. Building community within the classroom, especially in times of crisis, can help students feel connected and supported, creating more resilience and a better overall learning experience. We must think ways to ensure a meaningful, holistic student experience and not just the few hours that students are in the classroom.

Our examples also illustrate the importance of making the learning experiences relevant to the real-world. The theory of Constructivism maintains that learners create their own understanding of the world based on their individual experiences and their interpretation of these experiences (Elliott et al. 2000). Making meaningful connections between the new knowledge and previous experiences helps to facilitate the learning process and improve student performance. Going forward, we should aim to foster more practical, problem-based educational opportunities through immersive engagement in real-life tasks so that students appreciate the practical value of what they are learning and contributing to workforce development. In the transition to online learning, faculty have learned that they need to pay attention to the community of learners in their online courses so students can discuss and learn from each other.Faculty have also learned to design their courses so they are easily accessible, to increase flexibility, to addresses equity, and to allow multiple types of opportunities for students to engage in the material. In addition, faculty have been encouraged to consider flexibility required in the online environment, and issues of equity and access in course design. Many faculty discovered a new world of evidence-based practices about online education which helped with the rapid transition to new learning modalities (Garrison et al. 1999; Schwartz 2019; Sandstrom and Rawn 2015; Darby and Lang 2019). This experience has increased confidence of faculty in their abilities to teach in an online environment, as well as contributed to a new appreciation of the benefits of online education. Some faculty who were previously convinced that online education was of low quality have changed their opinions (Lederman 2020b). Additionally, as described in the faculty case studies, faculty understanding of the direct connection between actively engaging students in the learning process and creating equitable learning environments for students from marginalized groups has been improved (Theobald et al. 2020). Administrative and governance units should continue to support these individualized efforts and develop institution-wide structures to foster inclusive and equitable learning environments.

While universities, students, and faculty were forced to convert to an online educational environment in order to respond to the pandemic, many will continue to embrace these innovations and adapt them for use in the future. The increased knowledge and skills of faculty with regard to online education will likely continue to shape higher education long after the pandemic ends. Higher education will continue to evolve and grow as new technology emerges, and globalization continues. Students who participate in these college experiences will be better prepared and resilient in the face of the next global crisis. Even after returning to in-person classrooms, institutions should continue to provide all faculty with training in virtual teaching. Faculty need opportunities to put their training into practice to ensure that we collectively continue to leverage innovative opportunities to connect with students and educational experiences in a global environment. Creating this administrative infrastructure for faculty development and support can also help to ensure that we are prepared to pivot teaching methods in case of a future similar crisis.

These lessons provide evidence that universities have taken advantage of the resources available to them as institutions of higher education, including bright minds, adept researchers, shrewd innovators, and pedagogical and technology expertise, combined with tenacious and resilient students. Collectively, universities have demonstrated their resolute commitment to successfully provide high-quality educational experiences for students, as well as the ability to adapt and overcome future local or global challenges.

Acknowledgements We would like to acknowledge the assistance of Budi Haryanto, Jim Huntley, Paulo Rodrigues, Jolanta Aritz, Anakkarat Tubtim Barth, César Alberto Lucio Ramírez, Claudia Treviño Alanis, Robin Young, Mark Carrier, Grace Honeywell, Jeffrey Measelle, Angela Long, and Jennifer Rice. We also wish to thank the APRU Secretariat for their dedication and hard work.

Note

1. Across North American university and college are sometimes used interchangeably. Throughout the chapter, we use both terms that best describe a particular higher education case as presented here.

References

APRU (2020) Quarantunes. Available from https://www.apruplus.org/student-competition

Balwant PT, Birdi K, Stephan U, Topakas A (2019) Transformational instructor-leadership and academic performance: a moderated mediation model of student engagement and structural distance. J Furth High Educ 43(7):884–900

Barton DC (2020) Impacts of the COVID-19 pandemic on field instruction and remote teaching alternatives: results from a survey of instructors. Ecol Evol 10(22):12499–12507

Bathgate ME, Aragón OR, Cavanagh AJ, Frederick J, Graham MJ (2019) Supports: a key factor in faculty implementation of evidence-based teaching. CBE—Life Sci Educ 18(2):ar22. https://doi.org/10.1187/cbe.17-12-0272

Bengtsson L (2019) Take-home exams in higher education: a systematic review. Educ Sci 9(4):267
Brassil CE, Couch BA (2019) Multiple-true-false questions reveal more thoroughly the complexity of student thinking than multiple-choice questions: a Bayesian item response model comparison. Int J STEM Educ 6(1):16
Brown PC, Roediger III HL, McDaniel MA (2014) Make it stick. Harvard University Press, Cambridge
Cardon P, et al. (2020) What Happens to global virtual teams when a pandemic hits? Maintaining normalcy and stability with disruption all around. W ABC Bull 2.1
Casey N (2020). College made them feel equal. The virus exposed how unequal their lives are. The New York Times, April 4. Available from https://www.nytimes.com/2020/04/04/us/politics/coronavirus-zoom-college-classes.html
Castelli FR, Sarvary MA (2021) Why students do not turn on their video cameras during online classes and an equitable and inclusive plan to encourage them to do so. Ecol Evol. https://doi.org/10.1002/ece3.7123
Cavanagh AJ, Chen X, Bathgate M, Frederick J, Hanauer DI, Graham MJ (2018) Trust, growth mindset, and student commitment to active learning in a college science course. CBE—Life Sci Educ *17*(1):ar10. https://doi.org/10.1187/cbe.17-06-0107
Couch BA, Wood WB, Knight JK (2015). The molecular biology capstone assessment: a concept assessment for upper-division molecular biology students. CBE—Life Sci Educ 14(1):ar10
Darby F, Lang JM (2019) Small teaching online: applying learning science in online classes. Wiley, Hoboken
Dirks C, Wenderoth MP, Withers M (2014) Assessment in the college science classroom. WH Freeman, New York
Elliott SN, Kratochwill TR, Littlefield Cook J, Travers J (2000) Educational psychology: effective teaching, effective learning, 3rd edn. McGraw-Hill College, Boston, MA
Esquivel P, Barajas J, Newberry L (2020) They know the pain of online learning. Here's what teachers, parents, and students did about it. LA Times, December 1. Available from https://www.latimes.com/california/story/2020-12-01/distance-learning-heroes-school-covid-19-teachers-parents
Esports Market Size, Share & Trends Analysis Report By Revenue Source (Sponsorship, Advertising, Merchandise & Tickets, Media Rights), By Region, And Segment Forecasts, 2020–2027. (2020). Market analysis watch. https://www.grandviewresearch.com/industry-analysis/esports-market#:~:text=The%20global%20Esports%20market%20is,USD%206.82%20billion%20by%202027.&text=North%20America%20dominated%20the%20Esports,share%20of%2040%25%20in%202019
Explore LA (2020) Historic LA. Available from https://www.facebook.com/watch/?v=2976176109157885; Entertainment and Hollywood Available from https://www.facebook.com/watch/?v=590280568524052; SoCAL Scenery and Landmarks Available from https://www.facebook.com/watch/?v=306324257467952
Freedman A, Voelker-Morris J (2020) Some atypical (and charmingly oddball) suggestions for creating belonging and community in the remote classroom. The Delta Kappa Gamma Bull: Int J Prof Educ 87(3):80–85
Freeman S, Eddy SL, McDonough M, Smith MK, Okoroafor N, Jordt H, Wenderoth MP (2014) Active learning increases student performance in science, engineering, and mathematics. Proc Natl Acad Sci 111(23):8410–8415
Garrison DR, Anderson T, Archer W (1999) Critical inquiry in a text-based environment: computer conferencing in higher education. The Internet and High Educ 2(2–3):87–105
Joy JP, Price RM (2020) Harnessing the power of the immune system: influenza vaccines. CourseSource. https://doi.org/10.24918/cs.2020.53
Kilgo CA, Sheets JKE, Pascarella ET (2015) The link between high-impact practices and student learning: some longitudinal evidence. High Educ 69(4):509–525
Kuh GD (2008) High-impact educational practices: what they are, who has access to them, and why they matter. Assoc Am Coll Univ 14(3):28–29

Laksov KB, Mann S, Dahlgren LO (2008) Developing a community of practice around teaching: a case study. High Educ Res Dev 27(2):121–132
Lancaster T, Cotarlan C (2021) Contract cheating by STEM students through a file sharing website: a Covid-19 pandemic perspective. Int J Educ Integr 17(1):1–16
Lederman D (2019) Online enrollments grow, but pace slows. Inside Higher Education, December 11. Available from https://www.insidehighered.com/digital-learning/article/2019/12/11/more-students-study-online-rate-growth-slowed-2018
Lederman D (2020a) Faculty confidence in online learning grows. Inside Higher Education, October 6. Available from https://www.insidehighered.com/digital-learning/article/2020a/10/06/covid-era-experience-strengthens-faculty-belief-value-online
Lederman D (2020b) The state of online education, before coronavirus. Inside Higher Education, March 25. https://www.insidehighered.com/news/2020b/03/25/survey-gauges-state-online-education-landscape-pre-coronavirus
Lindberg E (2020). USC campus in Minecraft-and its amazing. USC News, Summer. https://news.usc.edu/trojan-family/students-build-campus-usc-minecraft/
Linder KE, Hayes CM (eds) (2018) High-impact practices in online education: research and best practices. Stylus, Sterling, p. 264
Lovett MC (2013) Make exams worth more than the grade: using exam wrappers to promote metacognition. In: Kaplan M, Silver N, LaVague-Manty D, Meizlish D (eds) Using reflection and metacognition to improve student learning: across the disciplines, across the academy. Stylus, Sterling, VA, pp. 18–52
Maldonado-Maldonado A, Rodriguez Gómez R (2019) Mexico: higher education under populism. Inside Higher Education, May 28. https://www.insidehighered.com/blogs/world-view/mexico-higher-education-under-populism-0
Mukhopadhyay S, Booth AL, Calkins SM, Doxtader EE, Fine SW, Gardner JM, Gonzalez RS, Mirza KM, Jiang X (2020) Leveraging technology for remote learning in the era of COVID-19 and social distancing: tips and resources for pathology educators and trainees. Arch Pathol Lab Med 144(9):1027–1036
Muniz H (2020) How many college students are in the U.S.? Best Colleges Blog, June 23. https://www.bestcolleges.com/blog/how-many-college-students-in-the-us/
National Academies of Sciences, Engineering, and Medicine (2018) How people learn II: learners, contexts, and cultures. National Academies Press, Washington
Peterson C, Seligman MEP (2004) Character strengths and virtues: a handbook and classification. Oxford University Press, Oxford
Priyadarshini C, Singh S, David R, Sayeed OB (2019) Effect of student leadership on academic performance and perceived employability: a longitudinal study on scale development and validation in the Indian context. South Asian J Manage 26(2):106–134
Ravi R (2020) APRU on JUMPSTART: How esports fellowships can pave the wave for a stable, ethical, diverse industry, December 22. https://apru.org/apru-on-jumpstart-how-esports-fellowships-can-pave-the-way-for-a-stable-ethical-diverse-industry/
Reinholz DL, Stone-Johnstone A, White I, Sianez LM, Shah N (2020) A pandemic crash course: learning to teach equitably in synchronous online classes. CBE-Life Sci Educ 19(ar60):1–13. https://www.lifescied.org/doi/full/10.1187/cbe.20-06-0126
Roberts JW (2015) Experiential education in the college context: what it is, how it works, and why it matters. Routledge, Milton Park
Sandstrom GM, Rawn CD (2015) Embrace chattering students: they may be building community and interest in your class. Teach Psychol 42(3):227–233
Schwartz HL (2019) Connected teaching: relationship, power, and mattering in higher education. Stylus, Sterling
Skalicky J, Warr Pedersen K, van der Meer J, Fuglsang S, Dawson P, Stewart S (2020) A framework for developing and supporting student leadership in higher education. Stud High Educ 45(1):100–116

Son C, Hegde S, Smith A, Wang X, Sasangohar F (2020) Effects of COVID-19 on college students' mental health in the United States: interview survey study. J Med Internet Res 22(9):e21279

Theobald EJ, Hill MJ, Tran E, Agrawal S, Arroyo EN, Behling S, Chambwe N, Cintróna DL, Cooper JD, Dunster G, Grummer JA, Hennessey K, Hsiao J, Iranon N, Jones II L, Jordt H, Keller M, Lacey ME, Littlefield CE, Lowe A, Newman S, Okolo V, Olroyd S, Peecook BR, Pickett SB, Slager DL, Caviedes-Solis IW, Stanchak KE, Sundaravardan V, Valdebenito C, Williams CR, Zinsli K, Freeman S (2020) Active learning narrows achievement gaps for underrepresented students in undergraduate science, technology, engineering, and math. Proc Nat Acad Sci 117(12):6476–6483

UW Medicine COVID-19 Support. 55 Word Stories. Available from https://faculty.uwmedicine.org/55-word-stories/

Wenger E, McDermott RA, Snyder W (2002) Cultivating communities of practice: a guide to managing knowledge. Harvard Business Press, Cambridge

Wieman CE, Rieger GW, Heiner CE (2014) Physics exams that promote collaborative learning. Phys Teach 52(1):51–53

Wiggins B (2019) The public exam system: simple steps to more effective tests. https://www.coursehero.com/faculty-club/classroom-tips/benjamin-wiggins/

Winkelmes M-A, Boye A, Tapp S (2019) Transparent design in higher education teaching and leadership: a guide to implementing the transparency framework institution-wide to improve learning and retention. Stylus, Sterling

Withers M, Monfared M, Fung FM, Lee VW, Ramírez CAL, Mendoza MAF, Zhou C, Vandegrift E (2021) Teaching in virtual environments: global educational development to respond to challenges and opportunities of the COVID-19 pandemic. Transform dialog: Teach Learn J 14(2)

Yezierski EJ, Bauer CF, Hunnicutt SS, Hanson DM, Amaral KE, Schneider JP (2008) POGIL implementation in large classes: strategies for planning, teaching, and management. ACS Symp Ser 994:60–71. https://doi.org/10.1021/bk-2008-0994.ch006

Chapter 8
University Networking in Improving Academic Resilience to COVID-19 Pandemic: Experiences from Bangladesh

Mohammad Golam Kibria and Md. Anwarul Abedin

Abstract The COVID-19 pandemic has adversely affected the conventional educational approaches in higher educational institutions. It has forced to transform the learning system from traditional classroom learning to a digital or online approach. In Bangladesh, however, as in other parts of the world this tremendous transformation at university levels alters the routine work of the stakeholders. Being a developing country, Bangladesh is experiencing a number of challenges in implementing the new approach (i.e., digital learning system) such as limited access to internet and lack of logistic supports at individual and institutional level. The collaboration among the universities of Bangladesh can aim to contribute to overcoming the challenges and thus boosting the resilience both students and teachers at higher educational institutions. This chapter focuses on the existing challenges at university levels in Bangladesh and the possible approaches to cope with the post-pandemic situations. Moreover, it highlights the importance of networking and/or collaboration among the leading universities in Bangladesh in terms of technological advancement, preparedness for other hazardous risks and most importantly the safety issues at the university level in Bangladesh. Therefore, this chapter aims to be a guidance for future crisis management and resilience building based on the experiences during this COVID-19 pandemic.

Keywords University network · Academic resilience · COVID-19 · Student health · Bangladesh

M. G. Kibria · Md. Anwarul Abedin (✉)
Laboratory of Environment and Sustainable Development, Department of Soil Science, Bangladesh Agricultural University, Mymensingh 2202, Bangladesh
e-mail: m.a.abedin@bau.edu.bd

T. Izumi et al. (eds.), *Safety and Resilience of Higher Educational Institutions*, Disaster Risk Reduction,
https://doi.org/10.1007/978-981-19-1193-4_8

8.1 Introduction

The global COVID-19 pandemic is one of the worst disasters of this century. Its unprecedented speed and spread have affected almost every part of the world. This pandemic situation has challenged different development sectors, including education (Jena 2020; Onyema et al. 2020). Most governments decided to temporarily close educational institutions in an attempt to reduce the spread of COVID-19 (Alghamdi 2021). In Bangladesh, however, as in other parts of the world, the COVID-19 pandemic significantly affected the traditional educational approaches in school and higher educational institutions (World Bank 2020). The educational institutions (e.g., universities) in Bangladesh have experienced an enormous change, which indicates the low level of resilience in coping with uncertainties and crisis. Therefore, it is crucial to building resilience among the universities to combat any future uncertain disasters.

The government of Bangladesh has shut down the universities immediately after the first COVID case detected in Bangladesh to restrict the spread of the pandemic among the students. In response to universities closures, most universities started to adopt a distance learning system and open educational platforms where the students and teachers can access remotely and limit education disruption (Di Pietro et al. 2020). During lockdown, students are using popular social media tools like WhatsApp, Zoom, Google Meet, Telegram, YouTube live, Facebook live, etc. (Daimary 2020). In Bangladesh's context, the education sector was affected more due to the spread of COVID-19 compared to other developed countries. This is mainly due to the limited logistic support at university and individual levels and inadequate disaster preparedness among the stockholders. Therefore, it is high time to prepare ourselves for any uncertain disasters in the future and build resistance to such pandemic situations to sustain our educational sectors.

Resilience can be referred as the ability to withstand any kind of disasters (Abedin and Kibria 2019). According to the United Nation report, approximately 94% of the student population has been affected by the negative impacts of COVID-19 (UN 2020). As the global COVID-19 pandemic has challenged the educational sectors across the globe including Bangladesh, it is important to build resilience to achieve sustainable development goals (Shaw et al. 2021). Resilience to COVID-19 pandemic in terms of education sector can be obtained by providing minimum or basic understanding of any uncertain disasters and building university and community linkage (Oikawa 2016).

Therefore, this chapter will highlight the impact of the global COVID-19 pandemic on education and research at the university level in Bangladesh and the possible way to build resilience to this pandemic situation through active collaboration among the universities. This chapter also aims to develop sustainable guidance for future crisis management in the university education sectors based on this pandemic's experiences.

8.2 Impacts of COVID-19 at Universities of Bangladesh

The COVID-19 pandemic significantly affected all the formal education sectors in Bangladesh, such as primary, secondary, and tertiary (higher education: universities). It has negatively influenced all the educational and training programs in all the universities of Bangladesh. The negative impacts of the COVID-19 pandemic on the academics, research, and health issues of the universities in Bangladesh have been highlighted in Fig. 8.1.

8.2.1 Impact on Academics

A critical impact of COVID-19 on academics (e.g., education and training) has been observed on teaching and training delivery. The students' propensity to become infected with the virus infections has led to the closure of universities. The education sector has embraced online tools (i.e., digital learning system or e-learning: remote learning) instead of traditional classroom learning. The transition to online medical education has also seen a change in examination methods. However, remote learning is even more challenging for vocational education and training (VET) students who have practical or workplace components in their course that they are unable to complete due to social distancing requirements (Mahdy 2020). The negative impacts of the COVID-19 pandemic on the undergraduate and postgraduate level academic programs at the universities were variable, as discussed below.

The academic program of the undergraduate students was affected the most at the universities of Bangladesh (Pokhrel and Chhetri 2021). The undergraduate classes were closed at the mid of the semesters with very short notice. Due to the difficulty in conducting online classes, the undergraduate classes remained postponed for almost a

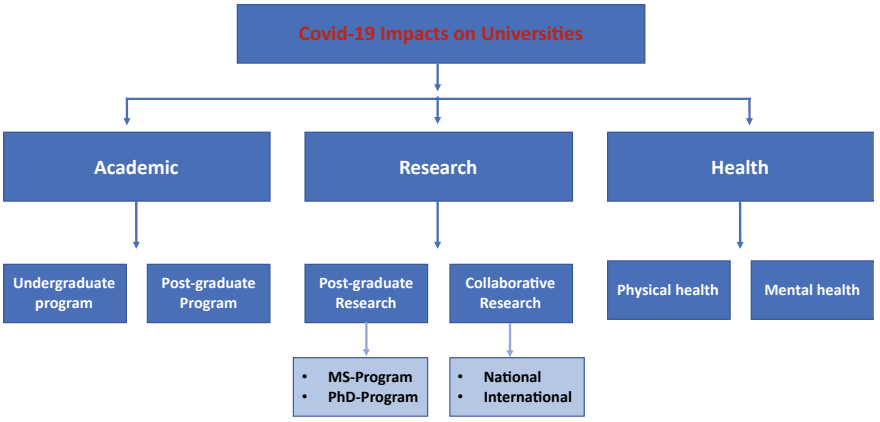


Fig. 8.1 Diagrammatic representation of COVID-19 impacts on Universities (*Source* Authors)

year. This sudden closure caused session the failure of the universities of Bangladesh to ensure that students graduate according to the schedule. The final year students at the undergraduate level were affected the most compared to others due to the postponement of their final examination, which delayed the graduation of many university students in Bangladesh.

At the postgraduate level, the research activities at the universities were significantly affected by the global pandemics along with the classroom lectures (Bao 2020). The negative impacts of the global pandemic were less pronounced among the postgraduate students than the undergraduate students because the postgraduate students got the chance to prepare themselves for the job market and have the provision to complete their post-graduation later. However, due to the immediate postponement of all laboratories and field-based research activities of the postgraduate students, the academic schedule of all institutes also hampered. It required a longer time to complete their post-graduation from the universities of Bangladesh.

8.2.2 Impact on Research

The negative impacts of COVID-19 on the research sector were rapid, dramatic, and no doubt will be long term (Harper et al. 2020). The research sector is one of the most frequently impacted sections in the universities in two different ways. Firstly, the ongoing or planned research programs were impaired mainly due to the closure of universities for a long time and restricted access to the laboratories to maintain social distancing. For instance, according to the survey by research professionals, approximately 65% of the researchers of the universities in the UK paused their ongoing research activities due to the pandemic (Bao 2020). The scenario is also similar in the universities of Bangladesh. Secondly, the global COVID-19 pandemic curtailed most academic, industry, and government basic science and clinical research and redirected all the research activities to COVID-19. All the funding authorities are interested in investing their money to address the problem of the COVID-19 pandemic (Shaw et al. 2021). Thus, all the researchers have focused on different aspects of COVID pandemic impacts and solutions. The number of studies related to COVID-19 is increasing daily, and the extent of global collaboration unprecedented. Therefore, the other essential and ongoing research programs are getting less importance compared to COVID-19 research.

The postgraduate and collaborative research projects running in all the universities of Bangladesh stopped with uncertainty due to the global pandemic's spread. The sudden shutdown of the student halls and universities postponed the ongoing research activities of all the postgraduate students both in the laboratories and field. Moreover, the collaborative research projects of the universities both at national and at international levels were also postponed due to the immediate shutdown of the research facilities at the universities. The extent of the global pandemic problem also caused

immediate postponed all the national and international seminars, training, conferences, and workshops, those in turn, significantly affected the research activities at all the universities of Bangladesh.

8.2.3 Impact on Health and Safety

The impact of educational sectors disruption by the COVID-19 pandemic extends from change in the learning system and health risk issue of the students (Chaturvedi et al. 2021). Isolation of the students from universities increased the unexpected dropouts. It significantly affected both mental and physical health due to the closure of the classes and all kinds of academic programs (Cao et al. 2020; Sahu 2020). The university students were exposed to a completely new and inconvenient way of learning. Due to the implementation of the digital learning system at the universities, the students were supposed to stay at home almost all the time, restricting their social involvement and daily co-curricular activities. The students remained frustrated and tense about their academic career due to the current pandemic situation's uncertainties. They do not even know when the academic program will resume and when they will get back to the university. Thus, it significantly affected the mental health condition of the university students of Bangladesh.

The physical health condition of the students also deteriorated due to this lockdown (Cao et al. 2020; Chaturvedi et al. 2021). The students cannot do any exercises and daily outdoor activities (i.e., playing cricket or football) in this pandemic situation. Thus, the students are getting obese or going extra weight, which is extremely harmful not only for the students but also for any human being. They are getting vulnerable to any diseases very soon due to their weak immune system, which is also a significant threat for future generations. Therefore, it is clear that the global pandemic situation is significantly affecting the physical and mental health conditions of the students at the university level of Bangladesh.

The spread of COVID-19 also disrupted the communication and transportation facilities within the universities (Kapasia et al. 2020). Although the student accommodation facilities are closed for more than a year, the teachers and staffs of the universities are living within or closer to the university areas. The limited availability of transportation facilities and restricted communication access within the university created an inconvenient environment for the teachers and staff associated with the universities. They become unable to go outside due to social restriction and getting sick both mentally and physically (Lee 2020). Therefore, it is evident that all the universities' stockholders, such as students, teachers, and other staff, experienced a significant mental health disorder due to the inconvenient environment.

8.3 Immediate Responses to Cope with Pandemic Situations

A timely call for a future action plan to cope with the global pandemic situation is imperative to build a resilient education system at all the universities of Bangladesh. The priorities in the action plan should include the followings:

Short term strategies:

i. Ensuring face masks and hand sanitizer for all the students, teachers, and staff at the university level before academic involvement. The university authority should circulate immediate action plan to address this issue strictly to ensure safe education environment.
ii. Personal protective equipment (PPP) should be supplied to all the teachers and students to ensure a safe learning environment. All the government and non-government organization should move forward with their logistic supports to revive the educational structure of the universities of Bangladesh.
iii. The entire academic program should be stopped immediately after any new case detected among the teachers and students. The spread should be stopped by isolating the infected person and traced the infections associated with the new infection.
iv. Increasing the number of COVID test for the community at each institutional level to ensure a safe learning environment. All the universities should have their own testing facilities to minimize community transmission among the stockholders of the university.

Medium and long term strategies:

i. The isolation section and immediate life care support (i.e., ICU) should be established within the university premises to tackle emergencies. Every university has separate health section, but this section requires more focus to provide immediate support to the students, teachers, and staff of the universities of Bangladesh.
ii. Student accommodation facilities should be managed with the highest priorities, as a couple of students share their room, and around 200–400 students are residing in a student hall. Thus, the risk of spreading the infection is very high at the university student accommodation. There must be some isolation rooms at each student hall to restrict the spread of the disease.
iii. The students residing at the student accommodation entirely depend on the local restaurants and canteen for their food at the university level of Bangladesh, which can be one of the potential sources of contamination. Thus, a healthy and hygienic food supply should be ensured for the students of the universities.
iv. Allocation of stipend for the needy students is also an immediate response to this global pandemic situation. The university grants commission (UGC) of Bangladesh and individual universities have already initiated this program to help the students with low family income to support their academic career.

8.4 Challenges in Implementing New Approaches

Being a developing country, Bangladesh is experiencing many challenges in implementing the remote learning system, such as inadequate funding, limited access to the internet, lack of logistic support at the individual and institutional level, limited internet access. The main challenges to implement the digital learning system are highlighted below:

i. All the universities referred to the financial implications as the most important challenge for their institutions. A digital learning system requires a handsome amount of money to establish at the universities. Due to the limited budget in a developing country like Bangladesh, the digital learning system facility is not available in all the universities of Bangladesh. Although some private universities continued to run their education program during this global pandemic, most public universities had to postpone their educational activities due to inadequate findings for developing a digital learning platform.
ii. The student's attitude is another critical issue to implement a digital learning system at the universities. The students are comfortable and used to the classroom learning facilities from the very beginning of their schooling, but the sudden change in the system made the learning system inconvenient. Thus, many students are not still welcoming this new system of learning.
iii. The digital learning platform requires many technical supports, such as a laptop and smartphone. Although most university teachers are equipped with the updated technological supports, such kinds of logistics are not available to all students. In the public universities of Bangladesh, many poor students are unable to buy a laptop and smartphones by themselves.
iv. Limited availability of internet and electricity facility is another problem to implement the digital learning system in Bangladesh. Being a developing country, the internet and electricity facilities have not reached every corner of Bangladesh. Many university students live in remote areas where internet facilities and electricity are not available, making the digital learning system incompatible with the students.
v. Some students are traveling back home to remote areas and may not be in a financial situation that will allow them to resume their studies once the epidemic is over.

8.5 Possible Action Plans to Enhance Resilience with COVID-19 and Such Other Crisis

Based on the experiences gathered during this COVID-19 global pandemic situation, all universities should prepare themselves for future uncertain disasters or pandemic situations to build a resilient education system. In Bangladesh's context, all the universities should work in collaboration with each other and plan accordingly to

manage any disaster or pandemic conditions. The possible action plans to build a resilient education system for any uncertain disasters or pandemics are highlighted below:

i. Learning should not be confined to classrooms or any specific boundaries. Students should be encouraged to engage themselves in personalized learning.
ii. The universities may run with different shifts per day to maintain the social distancing. Thus, the universities may run their academic programs in different shifts with low number of students in the classrooms.
iii. Establishment of an ICT unit and all the logistic support at each educational institution may help mitigate the adverse effects of any pandemic situations in the future.
iv. Development of a voluntary unit at university level comprising teachers, students, and staff.
v. Establish a disaster risk reduction unit at the university level to build resilience to any uncertain disasters among the community members (both teachers and students).
vi. Including disaster risk education with our existing curriculum can contribute to building resilience to any pandemic situations.
vii. Many entrance tests job recruitments got canceled which created negative impact with a great challenge in the life of a student of higher education. For new university graduates, policies should support their entry to the job market to avoid longer unemployment periods.

8.6 University Networking and Collaborations to Build Resilience

The COVID-19 global pandemic created the need of active collaboration among the universities and introducing virtual education system. The existing network of 18 public and private universities of Bangladesh across the north–south and east–west directions is working together to build resilience to any kind of disasters. It is noteworthy that Bangladesh Agricultural University is working as the main hub of this university network of Bangladesh. University networking and collaboration are crucial to building resilience to these global pandemic situations. It may help in building resilience to the recent pandemic by changing different aspects as highlighted below:

i. Teachers and learners should learn how to utilize the online teaching learning processes by using technologies. In this context, the engineering and science and technology universities in Bangladesh may take the opportunity to train other university professionals and develop some new convenient ways of learning system.
ii. Similar courses running at different universities of Bangladesh should collaborate each other in creating online learning materials. The quality of the same

online learning materials may differ from one university to another. But an active collaboration among the teachers may help in developing a well-designed and effective learning source for all the students regardless of the universities. It will also help in decreasing the cost and efforts involving in creating multiple learning materials on the same topics.

iii. The universities should sit together to develop a uniform new assessment technique in collaboration with the UGC. The academic assessment can be done through online or small projects or quizzes. But it should be ensured that the assessment approach for a disciplinary area should be uniform across all the universities of Bangladesh, and this can be achieved only by active university networking and collaborations.

iv. The universities should move together to install a high-speed internet and logistic support. The vice-chancellors of all the universities of Bangladesh should take the responsibility to get it approved from the government to sustain the educational sector.

8.7 Concluding Remarks

This chapter has outlined the impacts of COVID-19 on the higher education along with the possible action plans in Bangladesh. The COVID-19 global pandemic significantly affected human life, the global economy, and healthcare systems worldwide. While the spread of the virus has resulted in far-reaching consequences, the closure of schools and universities has led to innovative methods of delivering education, ensuring that students continue to receive teaching, albeit with different limitations at the university level of Bangladesh. The active collaborations among all the universities in Bangladesh can build resilience to the global pandemic situation. It is an excellent opportunity to better prepare the universities to address similar pandemic situations in the future. Although, in the short term, the universities are trying to cope with this global pandemic situation, it can also be a chance for the institutions to learn about future uncertain crisis management. It may lead to increasing the universities' resilience when responding to unforeseen challenges in the future.

References

Abedin MA, Kibria MG (2019) Resilience to water related disasters: risks, vulnerabilities and coping strategies in Dhaka. In: Ray B, Shaw R (eds) Urban Drought: emerging water challenges in Asia. Springer, Singapore, pp 113–129

Alghamdi AA (2021) Impact of the COVID-19 pandemic on the social and educational aspects of Saudi university students' lives. PLoS ONE 16(4):e0250026

Bao W (2020) COVID-19 and online teaching in higher education: a case study of Peking University. Hum Behav Emerg Technol 2:113–115

Cao W, Fang Z, Hou G, Han M, Xu X, Dong J (2020) The psychological impact of the COVID-19 epidemic on college students in China. Psychiatry Res 287:112934

Chaturvedi K, Vishwakarma DK, Singh N (2021) COVID-19 and its impact on education, social life and mental health of students: A survey. Child Youth Serv Rev 121:105866
Daimary P (2020) E-Learning in schools during COVID-19 pandemic in rural areas. Int J Manag 11(10):659–664
Di Pietro G, Biagi F, Costa P et al (2020) The likely impact of COVID-19 on education: reflections based on the existing literature and recent international datasets
Harper L, Kalfa N, Beckers G, Kaefer M, Nieuwhof-Leppink AJ, Fossum M, Herbst KW, Bagli D ESPU Research Committee (2020) The impact of COVID-19 on research. J Pediatr Urol 16(5):715–716
Jena PK (2020) Impact of COVID-19 on higher education in India. Int J Adv Educ Res 5(3):77–81
Kapasia N, Paul P, Roy A (2020) Impact of lockdown on learning status of undergraduate and postgraduate students during COVID-19 pandemic in West Bengal, India. Child Youth Serv Rev 121:105194
Lee J (2020) Reflections features mental health effects of school closures during COVID-19. The Lancet Child Adolesc Health 4:421. https://doi.org/10.1016/S2352-4642(20)30109-7
Mahdy MAA (2020) The impact of COVID-19 pandemic on the academic performance of veterinary medical students. Frontiers Vet Sci 7:594261
Oikawa Y (2016) International cooperation: ESD and DRR in Japan. In: Shiwaku K, Sakurai A, Shaw R (eds) Disaster resilience of education systems: Experiences from Japan. Springer, Tokyo, Japan, pp 143–180
Onyema EM, Eucheria NC, Obafemi FA, Sen S, Atonye FG, Sharma A (2020) Impact of Coronavirus pandemic on education. J Educ Pract 11(13):108–121
Pokhrel S, Chhetri R (2021) A literature review on impact of COVID-19 pandemic on teaching and learning. High Educ Future 8(1):133–141
Sahu P (2020) Closure of universities due to coronavirus disease 2019 (COVID-19): impact on education and mental health of students and academic staff 12(4). pmid: 32377489
Shaw R, Sakurai A, Oikawa Y (2021) New realization of disaster risk reduction education in the context of a global pandemic: lessons from Japan. Int J Disaster Risk Sci. https://doi.org/10.1007/s13753-021-00337-7
UN (United Nation) (2020) Policy brief: education during COVID-19 and beyond. United Nations, New York
World Bank. 2020. The COVID-19 pandemic: shocks to education and policy responses

Chapter 9
New Role of Universities: Experiences from Taiwan

Tsung-Yi Pan, Hsin-Mu Tsai, Jen-Sen Liu, Chi-Huang Chen, Wei-Shun Chang, Yan-Hong Zheng, and Hung-Chi Kuo

Abstract In the severe epidemic situation, the role of universities in Taiwan should not only perform traditional education and academic research functions, but also effectively prevent severe and special infectious pneumonia in terms of the university's social responsibility. Because Taiwan currently does not have a vaccine for COVID-19, the border epidemic prevention strategy is given priority to prevent the virus from entering the community. In terms of colleges and universities, the main strategy is to require everyone wear masks and maintain sufficient social distance to reduce the risk of contracting the virus. At the same time, the real-name system is adopted to improve the accuracy of the epidemic investigation. Accordingly, through cross-domain integration, National Taiwan University not only strengthens NTU COOL's remote teaching services, but also develops an automated temperature-measuring device with a contact tracing system to help the Epidemic Prevention

T.-Y. Pan (✉) · H.-C. Kuo
Center for Weather Climate and Disaster Research, National Taiwan University (NTU), Taipei, Taiwan
e-mail: tsungyi.pan@gmail.com

H.-M. Tsai
Department of Computer Science and Information Engineering, National Taiwan University (NTU), Taipei, Taiwan

J.-S. Liu
Department of Electrical Engineering, National Taiwan University (NTU), Taipei, Taiwan

C.-H. Chen
Computer and Information Networking Center, National Taiwan University (NTU), Taipei, Taiwan

W.-S. Chang
Digital Learning Center, National Taiwan University (NTU), Taipei, Taiwan

Y.-H. Zheng
Computer and Information Networking Center, National Taiwan University (NTU), Taipei, Taiwan

T. Izumi et al. (eds.), *Safety and Resilience of Higher Educational Institutions*, Disaster Risk Reduction,
https://doi.org/10.1007/978-981-19-1193-4_9

Command Center quickly grasp the chain of infection. However, community infection broke out in May 2021. National Taiwan University immediately adopted to comprehensive remote teaching, and real-name tracing system should also be implemented. Finally, through the sharing of Taiwan's experience, we hope that Institutions can refer to it and further enhance campus safety and resilience.

Keywords Social responsibility · Social distance · Remote teaching · Automated temperature-measuring · Contact tracing system

9.1 Overview of Taiwan Government's Epidemic Prevention in the Higher Education System

Science and technology advancement has improved transportation, allowing various countries' development to internationalize gradually. This in turn enables the international population to circulate, with the spread of diseases becoming easier. Infectious diseases often break out quickly, and the development of the epidemic has attracted public attention. In the past two decades, infectious diseases that have newly appeared in humans are called "emerging infectious diseases." They have rapidly increased in number, and some have even developed drug resistance, which has severely impacted human health, social security, and economic stability (Li et al. 2014). Taiwan has been continuously affected by the novel influenza A (Novel Influenza A Virus Infections) and seasonal influenza H1N1 since SARS in 2003, the 2009 global H1N1 influenza pandemic, and China's H7N9 avian influenza epidemic in 2013. The epidemics gradually receded due to Taiwanese health agencies' active infection control strategy, showing the importance of the infectious disease. Taiwan has thus developed its current anti-epidemic system based on its previous anti-epidemic experience (Yen et al. 2014).

The methods of selecting and taking courses in colleges and universities are more flexible and diversified compared with junior high schools and below. The interaction between the university campus and the community is also closer. In order for colleges across the country to properly, quickly, and accurately respond to COVID-19's development, Taiwan's Ministry of Education decided to delay the semester start date for higher education from the original mid-February 2020 to March 2. It was also announced in mid-February that National Cheng Kung University, China Medical University, and Asia University would work to publish a "College & University Infectious Pneumonia Prevention and Control Work Outline" (NCKU et al. 2020). It was hoped that prior to the semester's start, all colleges and universities would mobilize all relevant units within each school to propose countermeasures to provide a safe and healthy campus environment at the beginning of the semester to maintain each school's normal operating functions. The Ministry of Education's key tasks for epidemic prevention in colleges and universities are as follows (Ministry of Education 2020):

1. **The establishment of the "Epidemic Prevention Advisory Group for Colleges and Universities"**
   COVID-19 pandemic is severe. In order to maintain the health of teachers and students and assist colleges and universities to respond properly, the Ministry of Education established the "Epidemic Prevention Advisory Group for Colleges and Universities." This group is responsible for epidemic prevention policy consultation, drafting a national prevention and control outline, assisting to review each school's contingency plans, visiting schools to consult, and responding to emergencies and other matters. The group also helped convene 1 to 2 medical schools in each of the North, Central, South, and East regions to assist with district counseling matters.
2. **Formulating the "Outline for the Prevention and Treatment of Severe Special Infectious Pneumonia in Colleges and Universities"**
   The Ministry of Education has established an epidemic prevention program for colleges and universities in order to enable colleges and universities across the country to properly, quickly, and accurately deal with the spread of the epidemic.
3. **Host the "Seminar on Prevention of Severe and Special Infectious Pneumonia in Colleges and Universities":**
   The Ministry of Education hosted the "Seminar on Prevention of Severe and Special Infectious Pneumonia in Colleges and Universities" at Fu Jen University, Cheng Gung University, Asia University, and National Cheng Kung University from February 20 to 21 to help schools fully grasp key points of campus epidemic prevention before the start of the Spring 2020 semester. 157 colleges and universities across the country sent their epidemic prevention commanders at or above the deputy commander level to participate in the seminar.
4. **Review school-wide contingency plans proposed by each school and give suggestions for improvement**
   The Ministry of Education asked all colleges and universities to draft and submit a school-wide contingency plan related to epidemic prevention before February 7, 2020. They were reviewed on the 15th of February.
5. **On-site school visits**
   The Ministry of Education conducted site visits in late February in order to supervise and understand each school's epidemic prevention operations and their implementation. Additionally, the Ministry inspected the school's planning and material preparation in high traffic areas such as classrooms, libraries, gymnasiums, restaurants, toilets, and dormitory environments.
6. **Establish a regional center**
   The Ministry of Education divided 157 colleges and universities across the country into North One, North Second, Central, South, and Eastern Districts to ensure all schools had professional assistance nearby. The Ministry designated medical schools or hospitals in each district as a Regional Center to assist in district counseling matters.

In 2006, the Ministry of Education formulated the "Implementation Measures for Distance Teaching in Colleges and Universities." Colleges and universities should

designate a dedicated unit to implement distance learning. The term "distance learning" refers to the interactive teaching conducted by teachers and students through communication networks, computer networks, video channels, and other transmission media. More than half of the teaching hours of a single subject shall be conducted via online teaching.

The implementation of online teaching in schools should be based on a learning management system (often called LMS) that can implement teaching, record student learning, and other support functions. A university that offers "distance learning courses" should design the teaching plan in accordance with the school's regulations (teaching objectives, students, syllabus, teaching methods, teacher-student interactive discussions, performance evaluation methods and class notes, etc.). Distance learning must be designed in accordance with the rules of the University Law. Curriculum planning and discussion procedures are stipulated by College Law, implemented after the approval of a school-level academic affairs meeting, and then finally announced via the Internet. Credits earned from distance learning classes count toward graduation.

Universities have launched online teaching mechanisms in response to the COVID-19 pandemic, if in-person classes need to be suspended or if students cannot return to Taiwan from overseas. The university will start an online teaching mechanism due to special circumstances resulting from the epidemic, no matter whether courses have applied for distance learning approval in the previous semester. Non-synchronized or synchronized online learning modes can be used. For example, teachers can plan and design courses via remote learning, design online discussions and tests, and put them on the learning management system in order to implement non-synchronous online teaching activities. Or, a teacher can use a synchronized online teaching system to teach and communicate online with students at the same time. Non-synchronous and synchronous online teaching were arranged in a timely manner according to course attributes and resources. If in-person classes were suspended, they could start immediately and seamlessly integrate.

9.2 Impacts of the Epidemic on Taiwan's Higher Education System

Universities implemented a rolling risk management strategy to counter the COVID-19 epidemic that began in February 2020. This strategy maintains the education and research function of Taiwan's colleges and universities, taking into account the health risk of teachers and students, as the number of confirmed diagnoses changes every week in the country. Figure 9.1 shows the number of confirmed cases in Taiwan from week to week starting from the second week of 2020. The first person diagnosed with the virus in the country's university appeared at Cheng Gong University in Southern

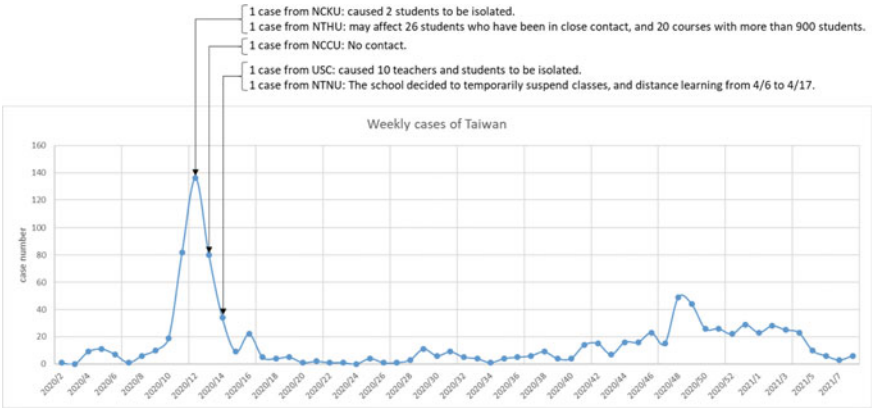


Fig. 9.1 Taiwan countrywide weekly COVID-19 confirmed cases vs. university confirmed cases

Taiwan in the 12th week of 2020. This patient was also Taiwan's first patient to have a "loss of smell and taste." Tsinghua University located in Northern Taiwan also recorded a local infection case caused by international travel. A confirmed case of an exchange student returning to Taiwan from Europe also appeared in Chengchi University in Northern Taiwan in the 13th week. An exchange student at the Shih Chien University in Northern Taiwan was diagnosed with the virus in the 14th week. A male professor was diagnosed after returning to Taiwan from the United States, resulting in 10 teachers and students being quarantined at home. Additionally, a college student at Taiwan Normal University was locally infected from an unknown source, forcing school authorities to temporarily suspend classes. Taiwan Normal University decided to switch to online learning starting in weeks 15 and 16.

This section reviews actions taken by National Taiwan University at different points in time during the epidemic as an example to illustrate relevant actions taken by Taiwan's higher education system to combat COVID-19.

- **The timeline of NTU's responses to the epidemic**

JAN 29, 2020: NTU's Academic Affairs Office held a cross-organizational epidemic prevention team meeting to complete the school-wide epidemic prevention strategy and management plan. After discussing with the administrative team, the university issued a school-wide epidemic prevention strategy letter at 11 o'clock that evening and issued a school-wide epidemic prevention strategy letter on January 30 in English. On January 30, the university's principal convened a school-level epidemic prevention and response team meeting.

MAR 23, 2020: Starting March 23, for two weeks, NTU took the following measures in response to the cluster of COVID-19 cases in Academia Sinica (Nangang):

1. NTU students and staff could not visit Academia Sinica, and all physical exchanges and visits between NTU and Academia Sinica were suspended.

Physical teaching and learning activities, including classes taught by joint-appointment or adjunct faculty or by instructors from Academia Sinica, were moved to distance learning for the following two weeks.
2. NTU students and staff who had been to Academia Sinica in Nangang District in the past two weeks (March 8–22), should implement two-week self-health monitoring at home (starting the day following the last contact date) and avoid coming to the campus.
3. Shuttle bus service between NTU and Academia Sinica was also suspended during this period.

MAR 25, 2020: In the following two weeks starting March 25, all nonessential club activities on campus were suspended to prevent the spread of COVID-19.

MAR 30, 2020: The NTU campus begun to implement access control, with each entrance and exit having a monitoring station. Access monitoring time is 7:30 to 19:30 every day (including holidays).

MAR 31, 2020: A confirmed student with the virus appeared at NTNU on the evening of the 30th. NTU immediately contacted National Taiwan Normal University to learn about the confirmed student's footprint history.

APR 08, 2020: Till the end of April, all NTU departments, institutes, and units moved to videoconferencing for meetings where a physical gathering was nonessential. Meeting organizers may consider using any appropriate videoconferencing software or applications, such as U Meeting and Zoom.

MAY 19, 2020: According to a press release (in Mandarin) published by the Central Epidemic Control Center (CECC) on May 13, restrictions on gathering size (100 people indoors; 500 people outdoors) will be lifted if the daily anti-COVID-19 instructions were strictly followed during the event. Starting June 1, NTU's anti-COVID-19 measures will be relaxed.

JUN 08, 2020: According to the press release (in Mandarin) issued by the Central Epidemic Command Center (CECC) on June 4, community epidemic control measures will be relaxed if no additional domestic cases were reported before June 7. NTU will thus loosen the current building access control measures. Starting June 8, visitors were only required to swipe their ID cards without temperature check for record keeping upon entering any building on campus. Access control stations staffed by NTU personnel in shifts were removed.

NOV 26, 2020: As fall turned to winter, the COVID-19 pandemic continued to worsen globally. On November 18, the nation's Central Epidemic Command Center (CECC) announced it would launch the "Fall and Winter COVID-19 Prevention Project" on December 1.

9.3 New Role of Universities for Teaching and Learning Methodologies: A Case of National Taiwan University

Traditional thinking will inevitably fail to respond to the new era. And the past economic model may not be able to drive the usual growth. Universities have long acted as the platform to drive generational change. They should now lead various stakeholders to think about future changes and direction together. At the same time, universities should actively connect the needs and resources of cities and industries and effectively operate as a platform for regional business partners. We need to plan a new paradigm for future generations based on mutual benefits and prosperity. The purpose of the new role of universities for teaching and learning methodologies was to effectively prevent the expansion of COVID-19, to ensure both the safety of the large number of faculty, staff, and students as the new semester began, and also the school's normal operations. Briefly, this section mainly explains the innovative actions taken by National Taiwan University for non-contact and contact learning due to the epidemic.

9.3.1 Non-contact Teaching: NTU COOL

NTU decided to move all courses in the Spring 2020 semester with more than 60 students online and encouraged faculty members to offer online classes in order to reduce the risk of cluster infection and to lessen COVID-19's impact on learning. This section presents how NTU COurses OnLine (NTU COOL), a digital learning platform developed and operated by NTU, took actions to assist teachers and met this urgent need for online teaching. NTU COOL features tools for video learning, online interaction, and learning footprint tracking. We also discuss how NTU COOL accommodated the unexpected, rapidly increasing traffic via prompt upgrades of its network, storage, and computing infrastructure. Consequently, at the end of the semester, NTU COOL served more than 24,000 online learning students and proved instrumental for NTU professors' online teaching experience. We believe that this has become a turning point for the entire NTU community to move toward innovative teaching and blended learning in the near future.

9.3.1.1 Overview of the Teaching and Learning in NTU During the COVID-19 Pandemic

Many schools made adjustments such as shutting down the campus and moving all the courses online due to COVID-19. Although Taiwan compared with other countries was relatively stable, NTU still undertook several countermeasures to reduce the risk of cluster infection and to lessen the COVID-19 impact on learning.

Table 9.1 Timeline of NTU teaching policy for Spring 2020

Date	Policy
Early February	Because of border control, many foreign students were not able to return to campus for the spring semester. The Office of Academic Affairs announced the "Measure in Response to the COVID-19 Pandemic," and classes with foreign students were asked to offer online learning
Feb. 21	The President and Digital Learning Center's online broadcast event was held to prepare the faculty for online teaching and to disseminate resources for preparation
Mar. 2	Spring semester started
Apr. 6	Classes with more than 100 students moved completely online
Apr. 20–24	Midterm exam: Many classes performed online exams or conducted assessments designed for online environments
Apr. 27	Classes with more than 60 students moved completely online
May 18	Classes with less than 100 students were allowed to move back to physical classrooms
Jun. 1	All classes were allowed to move back to physical classrooms
Jun. 15–19	Final exam

Table 9.1 shows the timeline and the teaching policy of NTU in the Spring 2020 semester. The policy can be split into three stages as the university faced different challenges in each stage. First, from February to March, they were requested to prepare for online teaching by acknowledging the pedagogy and techniques. Starting from April, all classes with more than 60 students were moved completely online, and online teaching was conducted in either a synchronous or asynchronous manner. In the last stage, the university investigated possible options and conducted course assessments online such as having online quizzes or assignments as substitutions.

NTU COOL, a digital teaching and learning platform developed and operated by NTU, played a crucial role in assisting teachers to meet this urgent need for online teaching. While NTU COOL features tools for video learning, online interaction, and learning footprint tracking, it helped teachers address challenges introduced by online teaching and served approximately 1/3 of NTU courses, i.e., more than 2000 courses, in the Spring 2020 semester. The number of courses and users increased about six times compared to those of the previous semester. The following section aims to introduce NTU COOL, share how it supported teaching and learning during the pandemic, and how it helped NTU promote online teaching with high effectiveness and efficiency.

9.3.1.2 NTU COOL and Its Video Learning Module

NTU COOL is the online Learning Management System (LMS) developed in 2018 by NTU's Digital Learning Center. This platform is based on Canvas LMS, which provides basic functions for teaching and learning activities like handouts

uploading/browsing, assignments submission, and grading. We further developed custom modules for video learning, online interaction, and footprint tracking aiming not only to provide a powerful tool for faculty members, but also to allow students the capability of autonomous learning and support them to manage their own learning pace. These are integrated with the base system via Learning Tools Interoperability (LTI).

One of NTU COOL's best developed features is a custom Video Learning module that lowered the barrier of online teaching. It allows users to upload their own videos and import videos from YouTube, to post comments and replies on specific parts of videos, play videos at different speeds, collect video viewing behaviors of students, and provide visualized statistical charts/graphics.

The following provides a quick description of the main functions provided by the Video Learning module.

1. Videos as teaching material.
    a. Add YouTube videos or upload video files: Video Learning module allows instructors to upload their own videos or to import public videos as their teaching material.
    b. Synchronized with Lecture Recording Systems: 21 classrooms in NTU are equipped with the automatic lecture recording system which records lectures taking place in the classrooms and, once the classes end, uploads the video files to the corresponding courses on NTU COOL. Instructors can import these lecture recordings to their course modules with simple steps and students can review the lectures by watching these videos.
2. A video player for flexible learning pace (see Fig. 9.2).

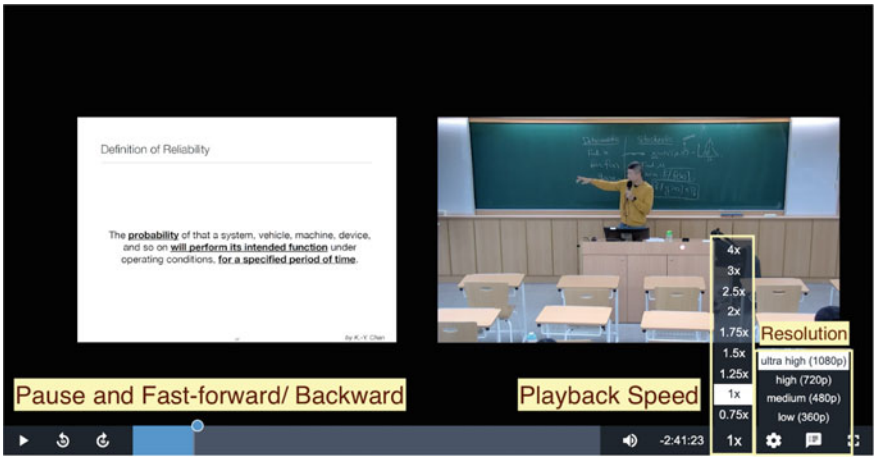


Fig. 9.2 Video player interface for flexible learning pace

Fig. 9.3 Each blue dot on the time line represents a comment at that specific time in the video. The comments are both shown during the video playback (**a**) and also below the videos (**b**)

One of the features of teaching videos is that students can learn at their own pace. NTU COOL's video player is designed to support this learning style. The module allows students to control video playback so they can pause the video for taking notes, search for a specific part to review, and skip parts which they are already familiar with. Additionally, students can choose video resolution, which helps overcome online learning limitations due to their internet environment.

3. Online interaction for in-depth learning.

   The module allows all course members, i.e., students, teaching assistants, and instructors, to leave comments or questions for a particular time in a video (see Fig. 9.3a and b). These real-time comments appear on the screen while the video is played and can be responded to by other course members. The feature encourages students who might be too shy to ask questions in a physical classroom to post their opinions online and leads to more online interaction. All the comments and their discussion threads can be exported to an Excel file, which offers a way to save these interactions and to conduct further analysis of students' feedback.

4. Learning history for better teaching and learning efficiency (see Fig. 9.4a and b).

   The module provides visualized statistical charts/graphics of students' video watching behaviors including their completion rate and the view counts of different parts of the video. This information enables instructors to keep track of students' learning pace to adjust their teaching pace accordingly.

9.3.1.3 NTU COOL's System Enhancement During the Spring 2020 Semester

After the service of NTU COOL was brought online in September 2018, the original plan was to gradually promote the platform and encourage the switch from the old platform over a span of a few years, during which COOL would be improved based on users' feedback. However, in Spring 2020, a complete change of plan took place

Fig. 9.4 Visualization of learning footprints provided includes the view counts and the completion rate of students for each video

due to the university epidemic prevention policy to cope with COVID-19. Courses with more than 60 students were instructed to completely move online. They require a new learning platform to support video-based learning and online interaction as the older one did not have these functions. Subsequently, the majority of these courses made the decision to leverage NTU COOL, where we saw the number of registered courses grew from 306 in Fall 2019 to 2,001 in Spring 2020, servicing more than 24,000 students.

To accommodate the unexpected growth and facilitate a smooth transition from physical classroom to online environment, we started our upgrade to various aspects of the platform, including system performance, storage, and network bandwidth, about two weeks before the semester started. The following describes our major upgrades in detail.

1. Storage upgrade for the video service
   Due to intellectual property considerations, NTU COOL chose to create infrastructure to host video within our campus instead of leveraging cloud storage solutions. Before the Spring 2020 semester, we continued to use a volume formed by 12 6-TB hard drives, which effectively allows the storage of 30 TB of files. However, after it was announced that courses with more than 60 students have to move online, we quickly took action to enlarge the volume. On March 27, we switched the storage of our production object server to an 87-TB volume that is capable to accommodate videos for at least 1,480 course. At the end of the semester, the total storage used by video files was approximately 40 TB. After the upgrade, we also made arrangements to secure additional NAS expansion unit and large-capacity hard drives. These additional drives were used to create a redundant system, for testing, and for future expansion. Today in 2021, we are working on switching to a distributed object storage system, where it allows high availability, reliability, and load balancing.
2. Upgrade of Video encoding service
   Similar to many other video streaming services, NTU COOL allows its users to select a proper video resolution during playback, so it can accommodate

different network environments. To do so, after a video file is uploaded, our system will schedule an encoding task for this particular file, where it will be converted to files with lower video resolutions. However, similar to other services, the unexpected rapid growth of the usage brought the encoding service over its original design limit. At some point in March, the number of uploaded video files grew faster than the number of files completing the encoding tasks. Thus, we had more than a few hundred files in the queue, waiting to be encoded. In late-March, we quickly took action to add three 24-core servers to the video encoding cluster; subsequently, all the files within the waiting queue were quickly processed and emptied, and the encoding tasks of new uploaded files can all be completed in the same day.

3. Network infrastructure upgrade
   Video streaming service consumes the most network bandwidth on NTU COOL. In early March, we observed that during lunch-time peak hours, the outgoing throughput of the object server was already at approximately 450 Mb/s (Fig. 9.5), which accounts for almost 50% of the 1 Gb/s links between the server and the network switch, as well as the optical uplink to the main campus router. To accommodate the foreseeable rapid growth of required network bandwidth, we gradually upgraded relevant network components during March, including the network interface card on the object server and on the NAS, the network switches, and the optical uplink to leverage 10 Gb/s hardware. Considering that a 1080p video consumes approximately 4 Mbps per user, after the upgrade, COOL is expected to serve 500–1,000 students to watch video simultaneously.
4. Stress testing the COOL web server
   Courses with more than 60 students cannot have classes in a physical classroom after April implied many large classes had to take their midterms online, e.g., on NTU COOL. Online exams present a great challenge to NTU COOL, as it is time sensitive and any system failure, data corruption or loss, or even long

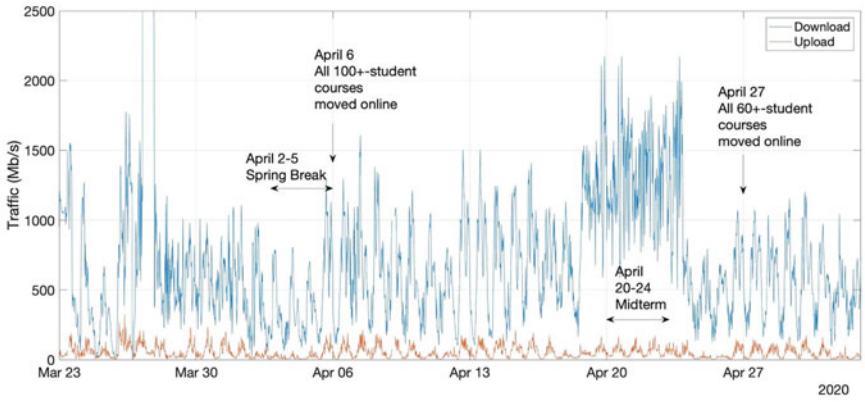


Fig. 9.5 The outgoing throughput of the object server

system latency, would have great consequences. Two weeks prior the midterm, our team started to leverage the open-source web stress testing tool, JMeter (Apache JMeter 1999), to perform stress tests to our online exam component of the system. Afterward, we were able to accommodate 500 students operating exam-related functions within the same minute, with a maximum latency of 10 seconds.

9.3.1.4 The Challenges of Promoting Online Teaching and How We Dealt with Them for NTU COOL

NTU has been promoting digitized teaching and blended learning for many years. However, since most of the faculty members need to dedicate themselves to teaching, researching, and administrative works at the same time, only a small part of the community are willing to redesign their courses and try innovative pedagogy. Urging instructors to move their classes online within such a short period of time under the pandemic presented a greater challenge to the university.

From the perspective of interacting with the students, many faculty members expressed that the primary concern about online teaching is that they will lose contact with their students (Aycock et al. 2002). Since students are accustomed to being passive learners, more discipline is necessary for them to succeed in completing online tasks (Allen and Seaman 2006). From the professional development perspective, faculty members indicated that there must be faculty support for course redesign and learning new teaching and technology skills (Vaughan 2007). High education faculty members are afraid of learning new technologies and are unaware of its benefits (Vaughan 2007). Additionally, the lack of resources provided by the institution will make resistance even stronger (Garrison and Vaughan 2013).

First, we used NTU COOL as a training platform for teachers and TAs to obtain both knowledge and technical guidance about online teaching. We provided a live broadcast, Digital Teaching Info Session, through NTU COOL a week before the semester started. In addition, two virtual training courses were uploaded onto NTU COOL. With these approaches, teachers prepared themselves for online teaching and got familiar with NTU COOL, the platform they would use in the following semester.

Second, we made NTU COOL an online classroom where teaching and learning activities can continue without interruption with course videos and online discussions. With a self-developed video module, NTU COOL allows teachers to upload videos and students to post comments or questions on specific parts of the video; in addition, reading materials posted on NTU COOL can be highlighted and annotated by the students, such that the students can collaboratively and interactively complete the reading assignment online.

Finally, teachers can evaluate the learning performance by online quizzes or analyze students' learning behavior with data visualization tools on NTU COOL. One of the greatest challenges teachers face when moving classes online is that they would lose contact with their students and won't be able to evaluate the learning outcome.

9.3.2 *Contact Teaching: An Automated Temperature-Measuring Device*

During severe acute respiratory syndrome (SARS) in 2003 or new influenza in 2009 (H1N1), and the current COVID-19 pandemic period, infected patients usually have elevated body temperature. Thus, body temperature is a preliminary screening to determine whether or not they are infected. Throughout the pandemic period, Taiwanese people need to receive body temperature screening when entering and exiting any public places to prevent and control the scope of infections.

NTU also implemented body temperature screening when during the pandemic. In 2009, technician Jen-Sen Liu from NTU's Department of Electrical Engineering needed to screen the body temperature of those who entered the department building. He observed that most of the body temperature-measuring devices used in NTU were forehead thermometers, ear thermometers, etc., all of which require a person to administer. He felt an infection risk when measuring the frontal temperature of teachers and students at close range. Additionally, measuring forehead temperature is not efficient, often resulting in long queues. Therefore, technician Jen-Sen Liu investigated much equipment on the market that can be used to screen body temperatures, such as infrared image body temperature monitoring systems. But, this kind of infrared system is expensive to produce and susceptible to environmental temperature. Body temperature detected by traditional forehead or ear thermometers is more accurate, but usually requires close contact. Therefore, Liu thought about the need of an automatic body temperature measurement device that is accurate and low cost.

Liu's solution used an infrared detector combined with an existing forehead thermometer. The device automatically screens a subject's temperature when his or her forehead is close to the temperature sensor. If the forehead temperature exceeds the set 37.5 °C, an alarm will alert the control personnel. The device is also equipped with a battery charging system, which can be moved to a control point without a constant power supply. The production cost of the basic device is only about NT$3,000, and the cost of the battery charging system is an additional NT$6,000. This low-cost and accurate device allows the subject to automatically and quickly measure body temperature without contact. The device had been tested in NTU's Department of Electrical Engineering during the H1N1 Pandemic in Taiwan in 2009. This original non-contact automatic temperature measurement device was later named "National Taiwan University Pandemic Prevention No. 1" as shown in Fig. 9.6.

On average, each NTU Pandemic Prevention No. 1 can measure about 1,000 subjects per day as shown in Fig. 9.7.

NTU's Electrical Engineering Department used NTU Pandemic Prevention No. 1 for pandemic prevention work, reducing on-duty workforce and risk of infection as shown in Fig. 9.8. With the consent and support of Dean Yao-Wen Chang of NTU's College of Electrical Engineering and Computer Science and Chairman Chung-Chih Wu of the Electrical Engineering Department, an article was published in Taiwan

Fig. 9.6 The NTU Pandemic Prevention No. 1, an automated temperature-measuring device

on March 10, 2020 promoting this cost-effective system. Additionally, the design drawing was published on the NTU's Department of Electrical Engineering's website, and units were offered to those in need across the country. School alumni from the class of 1975 generously donated the units when they heard the report of Pandemic Prevention No. 1. They entrusted the College of Electrical Engineering and Computer Science to produce the device and distributed them to elementary and middle schools, public institutions, and other departments and units within the university that needed pandemic prevention. A total of 82 groups received donated units.

Fig. 9.7 The visitor does not need to touch any part of the forehead thermometer, as long as the forehead is close to the temperature measurement sensor. Temperature value can be seen from the L-shaped mirror

Fig. 9.8 The NTU Pandemic Prevention No. 1 was used in the epidemic prevention work at Electrical Engineering Building II

9.3.3 Contact Tracing System

National Taiwan University announced its pandemic traffic control for entering buildings and dorms (dubbed the National Taiwan University Spotlight 2020) when the new semester started on 3/2/2020. Each building entrance would be staffed by a single person 8:00 to 17:00 each day to monitor entrance control and body temperature checks.

Each building's access control uses an id card swiping device to log in personnel visit records. However, this system caused long lines at the entrance of each building. As a result, NTU's Computer and Information Networking Center (hereinafter referred to as CINC) was assigned by the university's epidemic prevention team to work with an undergraduate student team from the Department of Electrical Engineering immediately to develop an upgraded "epidemic prevention control system," with digital footprint capabilities and real-time identity verification via the Internet. After field inspections and continuous process flow improvement, CINC assisted in upgrading and refurbishing the original NTU Pandemic Prevention No. 1 to achieve automated body temperature measurement and name registration, and helped integrate it into the epidemic management and control system.

This "epidemic prevention control system" can upload temperature and foot traffic data taken at each control point on the campus to the CINC database. Concurrently, the system can share temperature measurement data between the premises in real time. Radio frequency identification (RFID) technology was also used to record footprint information to help implement tracking control for the system and assist in subsequent epidemic investigations if needed. Additionally, in response to confirmed cases from surrounding schools and close contacts with research institutions, the system also activated a filtering mechanism to produce a "high-risk group" isolation list (including: home quarantine, home isolation, and independent health management).

9.3.3.1 R&D Process

NTU's epidemic prevention control system did not have detailed specifications and sufficient development time compared to the university's normal development procedures. The entire R&D process was based on past experiences with Severe Acute Respiratory Syndrome (SARS) in 2003.

The R&D process concluded the system required NFC and barcode readers as input devices because the school's faculty, staff, and student ID cards have built-in Mifare chips, while alumni and students from other schools can only be identified by barcodes. In order to be able to quickly deploy to various buildings, the system uses a web-based architecture. So as long as there is a computer with Internet access, a control point can be set up. Multiple computers can also be configured for distributed processing at the same time to process large flows of people during peak hours. After a visitor's credentials are scanned by the entrance guard, the system, which is linked to the NTU Computer Server, can query a person's basic information to check whether

he or she is on the high-risk isolation list and the visitor's entry record for today. A visitor's basic information, temperature for the day, and high-risk alert are all uploaded into the university database in real time. A person's footprint history is also stored, allowing for future tracking. Most importantly, a person's temperature record can be shared in the school, eliminating the need for repeated measurements and reduces close contact risk.

The Pandemic Prevention No. 1 upgrade plan was initiated at the end of April 2020 to further integrate body temperature measurement and entrance control of buildings. The original Pandemic Prevention No. 1 used infrared sensors to utilize the forehead thermometer to measure body temperature. Body temperature data is reflected by two mirrors for visual identification by a door guard. The original system also needed to solve the issue of a visitor's identification and transmission of temperature data. The goal of the upgrade plan was to solve these issues by automating the recording and transmission of body temperature and identification.

The temperature gun on the Pandemic Prevention No. 1 has a warning function that will emit a warning sound when a visitor's body temperature is too high. The easiest way to judge whether the body temperature is too high is to intercept the IC circuit electronics that drive the buzzer. When Professor Li Hong-Yi from NTU's Department of Electrical Engineering looked in the Department's online community for help, Chen Bai-Zhi, a senior in the Department, and 6 other students were invited to form the "Epidemic Prevention Friends Association" (Chen et al. 2020). First, they used a logic analyzer to find the transmission code of the body temperature data. Then, they located the IC's signal pin to bridge the body temperature data and transmitted it through the Arduino development board. Second, they used NFC Reader, Barcode Reader, and WIFI wireless network modules to connect to CINC's anti-epidemic control system's WebAPI to upload the data. A person's information can be transmitted via Bluetooth from the registration database to the computer running the access control system at the entrance. The group worked day and night and the first upgraded version of the Pandemic Prevention No. 1 prototype came out in just 2 weeks. It immediately entered mass production, with more than 100 units being produced within a month.

9.3.3.2 System Introduction

There are many electronic administrative systems in NTU. Single-sign-on (SSO) and various information services across the school are integrated into the same portal to create "My NTU Portal." This system reduces the problems of switching between systems and repeated applications for accounts. The "epidemic control system" was built utilizing the school administration system structure and is shown in Fig. 9.9.

Devices at all entrance control stations are connected through the school's wireless network environment. Information that is collected is transmitted to CINC through the network to store. When a visitor registers again, system will show if that visitor

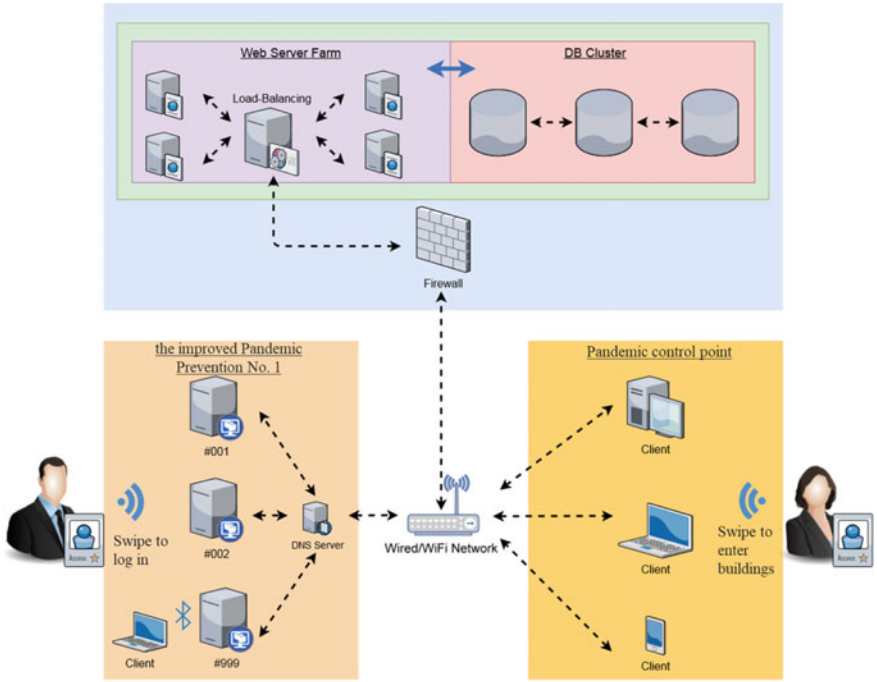


Fig. 9.9 Pandemic prevention control system

has past records. The control station's desktop layout is shown in Fig. 9.10. For the improved "Pandemic Prevention No. 1," Web API (Application Programming Interface, API) for two-way communication is used. If the device is connected to the computer via Bluetooth settings, relevant information will be sent to the computer screen after the system responds. If a person's body temperature is normal or if they have entered the building that day, the screen shown on the left of Fig. 9.11 will appear. When the system authenticates a person's name, it will also query whether that person has entered other buildings and if he or she is on high-risk group list. If relevant records are found, a response will be displayed on the system's screen shown on the right of Fig. 9.11.

All NTU departments usually include 3rd party contractors, such as cleaning personnel, due to operational needs. The system also provides each department to upload their contractors' information. Temporary cards issued to them can be created with a RFID card number. Additionally, electronic ticket cards such as Taipei Metro's Easy Card or iPASS Card can be used for identification purposes also.

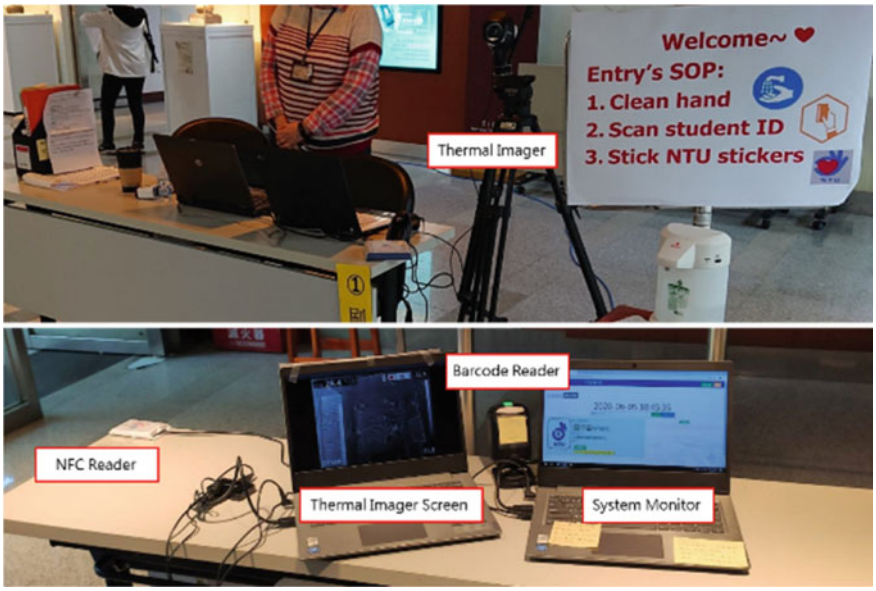


Fig. 9.10 System set up and placement

Fig. 9.11 Epidemic prevention control system UI

9.3.3.3 Benefits and Contributions

The following discusses the purpose of establishing the epidemic prevention control system and the benefits associated with the contact tracing system, control of high-risk groups, and reduction of operational costs:

1. **Real-name contact tracing and control**

Taiwan's implementation of its anti-pandemic strategy has achieved remarkable results seen around the world. The government implemented real-name contact tracing to ration face masks and other anti-pandemic materials. Additionally, the same system helped execute access control measures for leisure and entertainment

venues. These were the same measures used by NTU. As of June 2020, NTU's population reached more than 340,000 people, with detailed statistics shown below (see Table 9.2). Implementing real-name contact tracing on campus can indirectly restrict non-official or non-school personnel from entering teaching buildings, but reduce the risk of teachers and students' infection in the school. If a confirmed infection occurs, the system can quickly trace those that came in contact with the confirmed patient and the place. This allows potential patients to be isolated and under medical observation.

2. **Managing and controlling high-risk group**

According to the Ministry of Education's standards for shutting down classes, if two teachers or students are infected, the entire school will have to shut down, no matter how large the school is. According to data analysis of a one-week period, as collected by pandemic prevention and control system described earlier in this chapter (as shown in Fig. 9.12), personnel entry and exit numbers peaked during the middle of the semester. The number of people visiting NTU's campus reached nearly 26,000 every day, and the number of ID card scans between buildings reached more than 80,000. The system helps avoid cluster spreads in the university.

3. **Significantly reduce the university's costs to fight the pandemic**

NTU's campus is located in Taipei City, but it is vast and scattered. The Main Campus is located at Roosevelt Road Section 4, Shuiyuan Campus is on Siyuan

Table 9.2 NTU population breakdown

As of June 2020			
	Male	Female	Total
Students currently enrolled	19,876	14,131	34,007
Faculty and campus police	2,805	3,376	6,181
Alumni (cumulative)	183,662	117,274	300,936
Post-doc, technical and R&D staff	427	235	662
Each department full time staff	×	×	373
Total	342,159		

Fig. 9.12 One-week usage statistics of NTU's Epidemic Prevention Control System (*Data source* NTU)

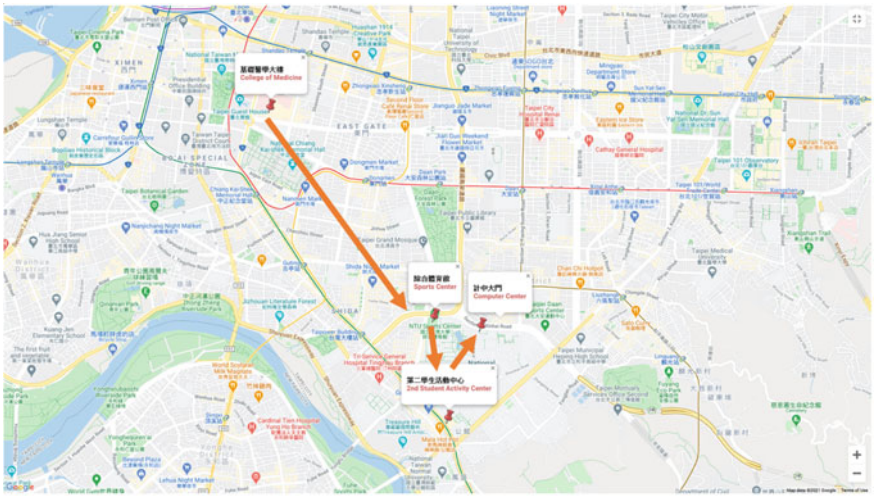


Fig. 9.13 Foot traffic tracing between campuses

Street, and Chengzhong Campus is located at NTU Hospital. A single entrance control point requires at least 2–3 people to operate. Staff scheduling and costs, such as overtime, had to be taken into consideration. But if the school wanted to change these control protocols by installing door devices on buildings, it would have faced increased procurement costs for access control devices. NTU's solution was a control system that leveraged the university's existing assets, such as its wireless network and school ID card, which allowed staff and students to shuffle between campuses (as shown in Fig. 9.13). When the same staff or student traveled from campus to campus, the system can share that person's temperature data to reduce the number of measurements, which also reduce staffing and hardware costs.

9.4 Benefits and Opportunities

For facing COVID-19 or such a new epidemic in future, NTU not only developed the digital learning platform, NTU COOL, for non-contact teaching, but also created the low-cost automated temperature-measuring device with a contact tracing system for face-to-face learning. The main contributions of different adaptations for teaching and learning could be described as follows.

Although the Spring 2020 semester was unstable and difficult, it was an unexpected turning point for both NTU COOL and NTU's digital learning pushing due to COVID-19. By the end of the semester, more than 2,000 courses, amounting to 30% of the semester's official courses, were brought online. The number of courses and users increased by about six fold compared to those of the previous semester. Additionally, more than 60% of the instructors uploaded videos onto NTU COOL

as their teaching material for online learning. According to a survey we conducted after the semester, more than 85% of the instructors expressed that they are likely to conduct hybrid learning in the following semester.

The goal of NTU COOL at the outset of development was to assist instructors in achieving innovative and hybrid teaching and to improve a student's learning outcome. As we can see from Figs. 9.14 and 9.15, most of the courses and teaching videos were designed and uploaded before early April 2020, i.e., within one month after the beginning of the semester. This demonstrates instructors can start implementing online teaching without much difficulty, by using the training courses about online teaching on NTU COOL.

As the global pandemic continues to spread and countries further tighten restrictions and protective measures, Taiwan's ability to continue its life as usual is rather remarkable. Going forward, real-name contact tracing and other anti-epidemic measures will be necessary for large event gatherings. NTU's recent large gatherings include the 2019 academic year graduation ceremony and the 2020 academic year opening ceremony, which followed strict government protocols on contact tracing and control, such as real-name registration and post-event analysis.

As many physical meetings and events are launched online and contact tracing systems are adopted before face-to-face learning, the discussion content has also shifted from focusing on "how to maintain the normal operation of the high education system" to "imagining, adapting, and preparing for a new era after the epidemic." The epidemic also inspired scholars in different fields to make full use of methods at different levels of technology to implement innovative and national-specific solutions

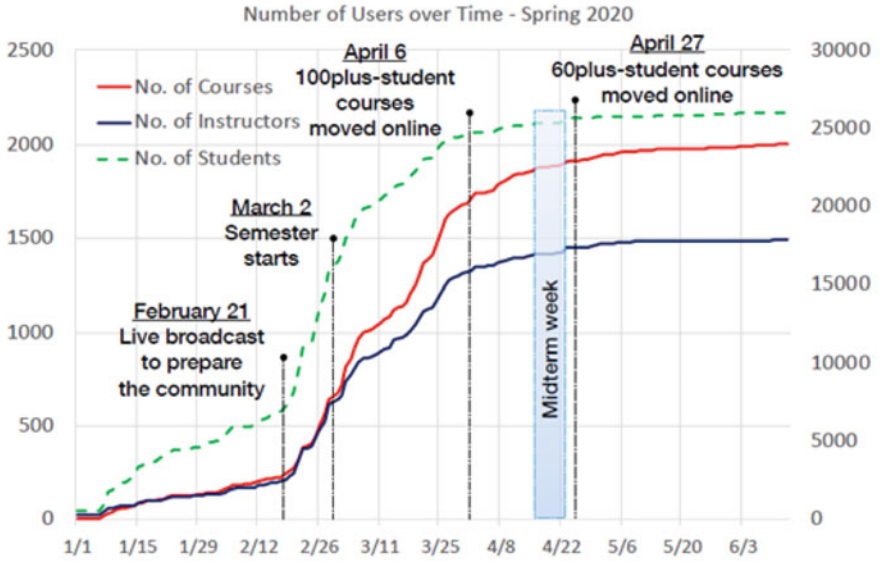


Fig. 9.14 Number of users over time on NTU COOL in spring semester of 2020

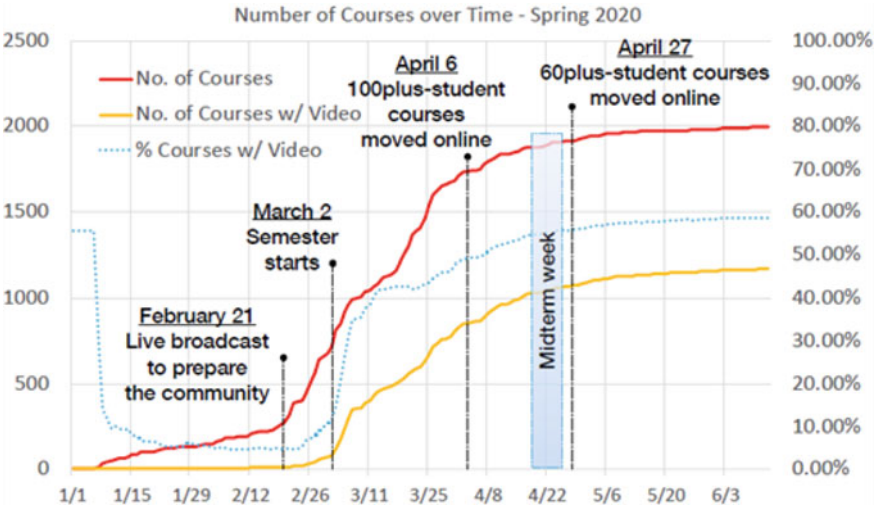


Fig. 9.15 Number of courses over time on NTU COOL in spring semester of 2020

to achieve the goal of universal education without interruption. This has also become a new benchmark for thinking about the value and mode of physical education in future.

9.5 Discussion and Conclusion

9.5.1 Discussion

The main strategies adopted by the Taiwanese government to combat a highly contagious epidemic and protect people before they are fully vaccinated are "maintaining adequate social distance" and "wearing a mask." "Wearing a mask" is a personal behavior, which can be achieved through punishment. "Maintaining adequate social distance" is what all colleges and universities can achieve through technology and governance. Therefore, this section is divided into two aspects: technological intervention and governance intervention.

9.5.1.1 Technological Interventions

National Taiwan University is one of the best higher education institutions in Taiwan. Therefore, in the severe epidemic situation, the role of National Taiwan University should not only perform traditional education and academic research functions, but also effectively prevent severe and special infectious pneumonia in terms of

the university's social responsibility. As school activities start again, the University must maintain the safety of a large number of faculty, staff, and students in school activities to ensure the normal operation of school functions. Traditional thinking will inevitably fail to respond to this new era, and the past economic model may not be able to deliver the usual growth. As an institution that has led generational transformation and thinking, universities should now lead various stakeholders to jointly think about this directional change. At the same time, they should actively link the needs and resources between cities and industries, and effectively operate cross-regional and business partner platforms. Based on the principle of prosperity and mutual benefit, we should plan and build a new paradigm for the next generation. Therefore, utilizing cross-unit cooperation, National Taiwan University combines the hardware research and development capabilities of the Department of Electrical Engineering and its Computer Center's information and communication system development capabilities to launch a low-cost, non-contact, real-name tracing, body temperature sensing system in a very short time. This entire system was developed to take into account personal data privacy, but also effectively grasp the footprint of the campus' traffic. In addition, as demand for non-contact teaching is increasing, NTU COOL, launched in 2018, will not only adjust online teaching functions to meet the teachers' needs, but also help most teachers who do not have remote teaching experience to quickly master the essentials of distance teaching. But most importantly, NTU COOL assists teachers to successfully complete the course teaching under a campus' closed state.

9.5.1.2 Governance Interventions

At the governance level, the success of Taiwan's epidemic prevention work in 2020 is mainly based on three policies: (1) wearing masks and maintaining sufficient social distance; (2) border epidemic prevention; (3) accurate epidemic investigation. The purpose of policy (1) is to reduce the risk of infection among the people; the purpose of policy (2) is to stop the virus from outside the country; and the purpose of policy (3) is to quickly identify the chain of infection and isolate it in time if a confirmed incident occurs. For colleges and universities, in addition to introducing remote teaching through 5.1.1 technology to reduce the risk of students' infection, the non-contact, real-name, body temperature sensing system is to improve the accuracy of policy (3) epidemic investigation. In addition, on May 11, 2021, in response to the announcement by the Central Epidemic Command Center that the epidemic alert standard will enter the second stage of epidemic prevention for 4 weeks from now to June 8, National Taiwan University immediately suspended gatherings of more than 100 people indoors and 500 people outdoors. Courses with more than 100 students must be changed to online teaching. However, the number of infection cases across the country continues to increase, and the epidemic is approaching the third stage of the alert standard. Therefore, it was urgently announced on May 14 that campus access control was implemented, all courses were changed to remote

teaching, and each department can adjust working methods according to the nature of the business content (including home office, remote office, or batch office) to ensure that the faculty, staff, and students maintain normal operations of the school's various functions in a way that minimizes the flow of people.

9.5.2 Conclusion

Taiwan has developed its current anti-epidemic system based on its previous anti-epidemic experience. Because Taiwan currently does not have a vaccine for COVID-19, and the incubation period between infection of the pathogen and the appearance of symptoms is an average of 5–6 days, so the border epidemic prevention strategy is given priority to prevent the virus from entering the community. In terms of colleges and universities, the main strategy is to require everyone wear masks and maintain sufficient social distance to reduce the risk of contracting the virus. At the same time, the real-name system is adopted to improve the accuracy of the epidemic investigation. Accordingly, through cross-domain integration, National Taiwan University not only strengthens NTU COOL's remote teaching services, but also develops an automated temperature-measuring device with a contact tracing system to help the Epidemic Prevention Command Center quickly grasp the chain of infection. However, because the government placed too much emphasis on border control but neglected to prevent domestic epidemics, community infection broke out in May 2021. National Taiwan University immediately adopted to comprehensive remote teaching, and University premises must continue to be staffed for taking temperature at the entrances and real-name tracing system should also be implemented. All departments and administrative offices should pre-plan how to work from home, work in different locations, or rotate staff in smaller groups. Finally, through the sharing of Taiwan's experience, we hope that Institutions can refer to it and further enhance campus safety and resilience.

Acknowledgements We thank Dean Yao-Wen Chang of NTU's College of Electrical Engineering and Computer Science for giving suggestions for revision of this article.

References

Allen IE, Seaman J (2006) Growing by Degrees Online Education in the United States, 2005, Southern. Distributed by ERIC Clearinghouse, Place of publication not identified

Apache JMeter (1999) https://jmeter.apache.org

Aycock A, Garnham C, Kaleta R (2002) Lessons learned from the hybrid course project. Teach Technol Today 8(6). http://www.uwsa.edu/ttt/articles/garnham2.htm. Accessed 3 Oct 2006

Chen B-Z, Shi L-W, Hsu Z-C, Shi Y-R, L Y-S, Wu L-Y, Huang S-C (2020) Automatic Forehead Thermometer Pandemic Prevention No. 1 upgrade development documentation. NTU's Department of Electrical Engineering, Epidemic Prevention Friends Association. https://github.com/TobyChen0106/Automatic-Forehead-Thermometer

Garrison DR, Vaughan ND (2013) Institutional change and leadership associated with blended learning innovation: two case studies. Internet High Educ 18:24–28. https://doi.org/10.1016/j.iheduc.2012.09.001

Li C-Y, Huang E-W, Liou D-M, Chiou S-F, Chiou S-J (2014) A study using Taiwan health statistics data to analyze the trend of communicable disease prevention after vaccination intervention. J Taiwan Assoc Med Inform 23(4):9–20

Ministry of Education (2020) A news entitled "The Ministry of Education and colleges and universities work together to do a good job in campus epidemic prevention, so that students can study at ease (in Chinese)." https://www.edu.tw/News_Content.aspx?n=9E7AC85F1954DDA8&s=439976695B37E7B1

National Taiwan University Spotlight (2020) COVID-19 preventive measures upgraded to ensure campus safety. National Taiwan University Web Site. https://www.ntu.edu.tw/english/spotlight/2020/1810_20200302.html

NCKU, CMU, and AU (2020) The outline of the prevention and treatment of severe special infectious pneumonia in colleges and universities (in Chinese). https://www.edu.tw/News_Content.aspx?n=0217161130F0B192&s=E75749E5FBC8D181

Vaughan N (2007) Perspectives on blended learning in higher education. Int J ELearn 6(1):81–94. https://search.proquest.com/docview/210364938?accountid=14229

Yen M-Y, Chiu AW-H, Schwartz J, King C-C, Lin YE, Chang S-C, Armstrong D, Hsueh P-R (2014) From SARS in 2003 to H1N1 in 2009: lessons learned from Taiwan in preparation for the next pandemic. J Hosp Infect 87:185–193

Part III
Innovative Response and Preparedness Based on Science and Technology

Chapter 10
Vigorous, Vital, Vulnerable: Universities and COVID-19, Aotearoa New Zealand

Ailsa Holloway

Abstract Aotearoa New Zealand's early responses to the SARS-CoV-2 pandemic were applauded globally. The government's "go hard and go early" response in March 2020 effected rapid reduction of both imported COVID-19 cases and community transmission. This was reflected in wide-ranging measures that reverberated across all sectors, including higher education. In a matter of weeks, teaching and learning shifted to online delivery methods nationwide, fast-tracking previously planned transitions to online teaching. While the subsequent easing of restrictions later in 2020 enabled return to in-person teaching, most universities had built valuable teaching capability, applying new technologies. Yet, despite the robustness of the tertiary sector's response, the pandemic revealed substantial challenges for students and staff. It also laid bare the sector's vulnerability to abrupt changes in international enrolment, and associated income. This chapter sketches the 2020 adjustments in New Zealand's university enterprise in response to the COVID-19 pandemic, examining the sector's robust technological adjustment. It also explores pre-existing vulnerabilities due to the impact of border restrictions on international student mobility and their consequences for university income.

Keywords SARS-CoV-2 · COVID-19 · Aotearoa New Zealand · Universities · Higher education · Pandemic response

10.1 Introduction

The far-reaching effects of the 2019–2021 SARS-COV-2 pandemic are indicative of cascading global disasters where the ripple effects of an extreme event increase progressively, with unexpected and significant consequences (Pescaroli and Alexander 2015; Cutter 2018). They also reflect the challenges inherent in complex, systemic risks that are driven by increasingly interconnected global conditions (Helbing 2013; UNDRR 2019). Systemic risks, unlike those that are amenable

A. Holloway (✉)
Auckland University of Technology, Auckland, New Zealand
e-mail: ailsa.holloway@aut.ac.nz

T. Izumi et al. (eds.), *Safety and Resilience of Higher Educational Institutions*,
Disaster Risk Reduction,
https://doi.org/10.1007/978-981-19-1193-4_10

to established risk management practice, are distinguished by their complexity and uncertainty, ambiguity and ripple effects that spread well beyond the original source (Renn 2021).

These attributes have characterised the COVID-19 pandemic, which by 28 March 2021, had resulted in more than 126 million confirmed cases and 2.8 million deaths (WHO 2021a; WHO Coronavirus (COVID-19) Dashboard 2021b). Remarkably, of all cases worldwide, only 16.5 million were reported from the World Health Organisation's South-east Asia and the Western Pacific regions despite the regions' combined population of almost four billion people (World Health Organization 2021a).

In the context of the COVID-19 pandemic, Aotearoa New Zealand's response has been applauded (WHO 2020a; Wilson 2020; Jefferies et al. 2020). Framed as "go hard and go early", the national response activated in March 2020 succeeded in limiting first wave spread to 1,501 cases. Even after the incremental lifting of tight border and physical distancing measures, by 31 March 2021, NZ's total cases had risen to 2,501 cases and 26 deaths (Ministry of Health 2021a). While these stringent, rapidly introduced controls proved effective in protecting public health, they also triggered wide-ranging disruptions, forcing sudden and prolonged adjustments in international travel and tourism, among other sectors.

As elsewhere, New Zealand's higher education sector was profoundly affected by these sudden measures to contain COVID-19. Not only did compliance with "lockdown" instructions require an abrupt shift from in-person to online learning across all tertiary institutions and accompanying support services for staff and students; it also required nationally concerted efforts to ensure coherence of response across universities.

This chapter sketches the over-arching response to COVID-19 by Aotearoa New Zealand's university sector. It begins by describing the context in which Aotearoa New Zealand's universities operate and continues by chronicling the country's response from early 2020 until March 2021. The chapter continues by outlining the university sector's engagement as an institutional frontline responder. This was expressed through its agility to adapt quickly to a dramatically changed operating environment and through its leadership of crucial research that provided evidence for an effective national response. The chapter also explores the wide-ranging social and other implications of the changed learning context for students and staff, recognising that this was also a period of immense difficulty for many. However, given the ongoing nature of the COVID-19 pandemic, the chapter's scope is limited to the period up until March 2021.

10.2 Overview of University Sector in Aotearoa New Zealand

Aotearoa New Zealand has eight universities with approximately 180,000 students, in addition to those enrolled in polytechnics, wānanga and tertiary private training

institutions. In 2019, the country's university student body comprised 81% domestic enrolments with a further 19% from international sources (Table 10.1). Altogether, overall student numbers ranged from 3,060 at Lincoln University to a high of 43,150 at the University of Auckland (Ministry of Education 2020a).

While the specific governance mechanisms for the country's universities are devolved to an institutional level, the sector also incorporates national structures and agencies for coherence, alignment and quality assurance. Crucially, the Ministry of Education is tasked with developing over-arching tertiary education strategies and policies, as well as providing policy advice and strategic research related to the sector. Similarly, the Tertiary Education Commission (TEC) carries responsibility for funding tertiary education nationwide (Ministry of Education, n.d.)

The Vice-Chancellors' of New Zealand's universities meet as the New Zealand Vice-Chancellors' Committee (NZVCC). The NZVCC is a statutory body responsible for quality assurance of New Zealand's university sector. The NZVCC is

Table 10.1 Students enrolled in Aotearoa New Zealand Universities, 2019

University	Campus locations	Students (Domestic)	Students (International)	Total
University of Auckland	Auckland (City, Epsom, Newmarket, Grafton, South Auckland)	34,445	8,705	43,150
Waikato University	Hamilton Tauranga	10,395	3,310	13,705
Massey University	Palmerston North Auckland (Albany) Wellington Distance	24,920	5,420	30,335
Victoria University	Wellington	18,725	3,645	22,370
Canterbury University	Christchurch	14,795	3,160	17,955
Lincoln University	Lincoln	1,710	1,310	3,060
Otago University	Dunedin Christchurch Wellington	18,190	3,130	21,330
Auckland University of Technology	Auckland (City, South, North)	22,120	5,370	27,490
Total		144,010	33,900	177,905

Note Source is *Education Counts: Summary Overview of Tertiary Education. Data Tables on learners in tertiary education and tertiary education providers: Provider Summary Tables* (Ministry of Education 2020a) https://www.educationcounts.govt.nz/topics/tertiary

responsible for two organisations that fulfil the statutory responsibilities between them. One organisation is Universities New Zealand—Te Pōkai Tara (UNZ). UNZ quality assures all university qualifications before they can be offered to students and provides an advocacy voice for the country's eight universities, "representing their collective views nationally and internationally". The other organisation is the Academic Quality Agency of New Zealand (AQA) which undertakes external quality assurance of universities through a regular cycle of academic audits.

National engagement on university-related issues is further enabled through other groupings. These include the country's Te Hautū Kahurangi | Tertiary Education Union (TEU), the New Zealand Union of Students Associations (NZUSA) and Te Mana Ākonga, the National Māori Tertiary Students Association. During the COVID-19, these stakeholders all played important roles in informing and supporting university action nationwide.

10.3 Revisiting Aotearoa New Zealand's COVID-19 Response

New Zealand entered 2020 on the back of two exacting public health emergencies as well as other disasters. It was emerging from a national measles epidemic that, by February 2020, would result in 2,195 cases and 774 hospitalisations (ESR 2020). The measles epidemic was not restricted to Aotearoa New Zealand, with the World Health Organisation also reporting outbreaks in Samoa, American Samoa, Fiji and Tonga (WHO/UNICEF 2020). This was manifested most tragically in Samoa, where more than 5,600 cases along with 83 deaths were reported across a 2019 population of only 197,100 (Thornton 2020; World Bank 2020a).

At the beginning of 2020, New Zealand was still reeling from the 9 December Whakaari White Island volcanic eruption and rescue, an event that would eventually claim 22 lives (Shand 2020). It was also providing additional support for fire-fighting operations during Australia's deadly 2019–2020 wildfires (New Zealand Government 2020). These emergencies, along with their interlinked domestic and transboundary dimensions, provided a backdrop to the nation's decisive response to the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) public health emergency.

New Zealand's first COVID-19 case was identified on 26 February 2020 as an arrival from Iran, with evidence of community transmission announced by 23 March (Hendy et al. 2021; RNZ 2021). Case numbers escalated, reaching 315 confirmed or probable cases by 25 March. Of the 84 cases reported on that date, 32 could not be linked to overseas travel and were dispersed nationwide, indicating mounting community transmission (Ministry of Health 2021b). This trend, reinforced by epidemiological modelling that indicated the country's health services would be inadequate to manage rapidly rising case numbers, underpinned an explicit policy decision to adopt a vigorous elimination strategy to manage the epidemic (Baker

et al. 2020b; Bloomfield 2021). The choice departed from more conventional mitigation approaches to influenza pandemic management, including the guidance in Zealand's Influenza Pandemic Plan, but was informed by early evidence from China, Taiwan, Hong Kong and South Korea that COVID-19 community transmission could be effectively contained (Baker et al. 2020a; Kvalsvig and Baker 2021).

On 23 March 2020, New Zealand's Prime Minister, Jacinda Ardern announced a nationwide "lockdown" for four weeks from 26 March. These Alert Level 4 conditions were extended until 27 April 2020, followed by incremental de-escalation of control measures to Alert Level 2 on 14 May 2020. The "go hard and go early" strategy effectively stabilised and reduced the number of new cases as lockdown measures were applied, along with vigorous testing, contact-tracing and heightened border controls that included government-managed isolation and quarantine (Baker et al. 2020b; Jefferies et al. 2020). From the notification of its first COVID-19 case in February 2020 until 13 May 2020, New Zealand recorded 1,502 probable and confirmed cases and 22 deaths (Ministry of Health 2021a). Subsequently, despite new outbreaks in August 2020 and January–February 2021 that led to the reinstatement of Alert Level 3 in Auckland, community transmission remained low and within containable levels.

While pandemic management continued well beyond 2020, the period March–May 2020 was pivotal for containing and controlling COVID-19 transmission in Aotearoa, as well as embedding wide-ranging elimination measures that enabled restoration of social and economic activity as in-country controls were lifted. It is suggested that this initial response occurred over five distinct phases as shown in Table 10.2 (Jefferies et al. 2020).

In the ten months from 14 May 2020 to 31 March 2021, the cumulative number of cases rose by approximately 1,000–2,501. However, across the epidemic period up until 31 March 2021, only 672 cases (27%) were locally acquired, while 1,339 (54%) were imported, and 448 (18%) import-related (Ministry of Health 2021b). Evidence of strong control and containment both of imported cases and community spread was reflected in only 242 confirmed cases of local transmission and four additional deaths from 14 May 2020 to 31 March 2021 (Ministry of Health 2021b). The vigour and effectiveness of public health measures were underlined by only 126 COVID-19 hospital admissions in total to 31 March 2021, including 18 in intensive care units (Ministry of Health 2021b).

Among the defining features of Aotearoa New Zealand's response to the SARS-CoV-2 pandemic were its ambitious adoption of a COVID-19 elimination strategy (Kvalsvig and Baker 2021) and the early introduction of a national COVID-19 Alert System. In both instances, New Zealand may have been the first country globally to adopt such measures that provided a unifying science-based framework for the national response. New Zealand's dramatic reduction and control of COVID-19 transmission by May 2020 has been attributed to its decisive policy commitment to a national elimination strategy. The decision to "go hard and go early" recognised that COVID-19's five-six day incubation period offered a critical intervention window to achieve national eradication of COVID-19. This policy materially resulted in the application of a suite of national interventions that combined border controls with

Table 10.2 Phases of Aotearoa New Zealand's initial first wave response (February–May 2020)*

Phase, Date and Focus	Illustrative National Measures Taken
Phase I: 2 February–15 March Initial travel restrictions	Restrictions on arrivals from mainland China, Iran, northern Italy, South Korea, as well as cruise ships
Phase II: 16 March–25 March "Rapid escalation of non-pharmaceutical interventions" (Jefferies et al. 2020)	20 March: Move from initial 14-day self-isolation of all international arrivals to border closures (except for returning citizens and residents) 22 March: Move to Alert Level 2 24 March: Move to Alert Level 3 25 March: Declaration of State of Emergency
Phase III: 26 March–10 April First half of nationwide lockdown	26 March: Implementation of Alert Level 4: Stay-at-home orders 10 April: "Mandatory state-managed quarantine for returning travellers" (Jefferies et al. 2020)
Phase IV: 11 April–27 April Second half of nationwide lockdown	Continuation of Alert Level 4: Stay-at-home orders Increased COVID-19 testing capability and completion of first asymptomatic population survey
Phase V: 28 April–13 May Two-step de-escalation	28 April: Step-down to Alert Level 3 14 May: Step-down to Alert Level 2

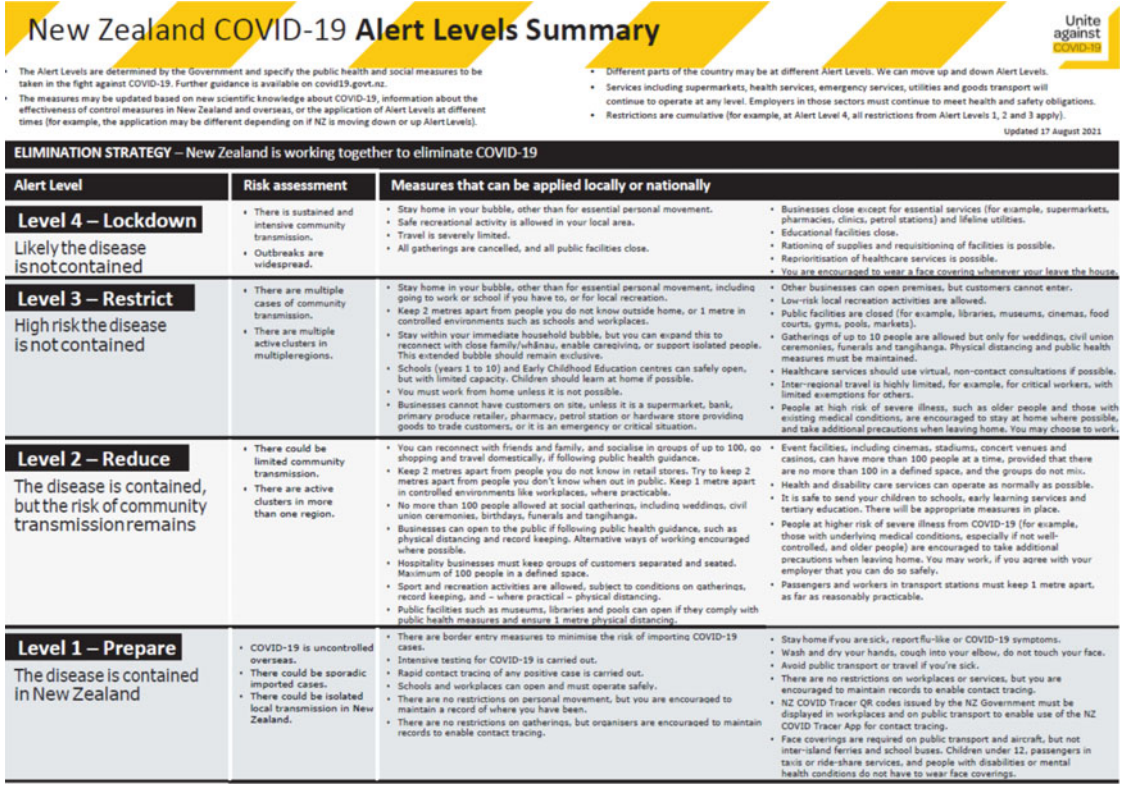
**Note* Adapted from Jefferies et al. (2020)

prompt case identification and isolation, augmented by rapid contact tracing and quarantine (Baker et al. 2020b; Kvalsvig and Baker 2021).

New Zealand's national COVID-19 Alert System was introduced on 21 March 2020, and preceded the announcement of lockdown conditions. This framework was built on widespread government and public familiarity with existing emergency alert systems for naturally triggered threats such as wildfires (Jones 2020) and was phased from level 1 ("prepare") to level 4 ("lockdown"). The COVID-19 Alert System provided a crucial architecture to guide coherent decision-making on response measures and risk communication, based on changes in COVID-19's epidemiological profile at both national and subnational scales (Fig. 10.1). It offered a scaffolding that could be uniformly applied temporally and spatially for a highly dynamic risk like COVID-19, along with its scope for application across geographical scales and different sectors, including New Zealand's university enterprise.

10.4 Aiming for a Coherent Sectoral Response

Aotearoa New Zealand's academic year begins between the months of February and March. In 2020, this period coincided with rapidly increasing cases of coronavirus in China and the virus' spread beyond China's borders (WHO 2020b).



New Zealand COVID-19 **Alert Levels Summary**

Unite against COVID-19

- The Alert Levels are determined by the Government and specify the public health and social measures to be taken in the fight against COVID-19. Further guidance is available on covid19.govt.nz.
- The measures may be updated based on new scientific knowledge about COVID-19, information about the effectiveness of control measures in New Zealand and overseas, or the application of Alert Levels at different times (for example, the application may be different depending on if NZ is moving down or up Alert Levels).
- Different parts of the country may be at different Alert Levels. We can move up and down Alert Levels.
- Services including supermarkets, health services, emergency services, utilities and goods transport will continue to operate at any level. Employers in those sectors must continue to meet health and safety obligations.
- Restrictions are cumulative (for example, at Alert Level 4, all restrictions from Alert Levels 1, 2 and 3 apply).

Updated 17 August 2021

ELIMINATION STRATEGY – New Zealand is working together to eliminate COVID-19

Alert Level	Risk assessment	Measures that can be applied locally or nationally	
Level 4 – Lockdown Likely the disease is not contained	• There is sustained and intensive community transmission. • Outbreaks are widespread.	• Stay home in your bubble, other than for essential personal movement. • Safe recreational activity is allowed in your local area. • Travel is severely limited. • All gatherings are cancelled, and all public facilities close.	• Businesses close except for essential services (for example, supermarkets, pharmacies, clinics, petrol stations) and lifeline utilities. • Educational facilities close. • Rationing of supplies and requisitioning of facilities is possible. • Reprioritisation of healthcare services is possible. • You are encouraged to wear a face covering whenever your leave the house.
Level 3 – Restrict High risk the disease is not contained	• There are multiple cases of community transmission. • There are multiple active clusters in multiple regions.	• Stay home in your bubble, other than for essential personal movement, including going to work or school if you have to, or for local recreation. • Keep 2 metres apart from people you do not know outside home, or 1 metre in controlled environments such as schools and workplaces. • Stay within your immediate household bubble, but you can expand this to reconnect with close family/whānau, enable caregiving, or support isolated people. This extended bubble should remain exclusive. • Schools (years 1 to 10) and Early Childhood Education centres can safely open, but with limited capacity. Children should learn at home if possible. • You must work from home unless it is not possible. • Businesses cannot have customers on site, unless it is a supermarket, bank, primary produce retailer, pharmacy, petrol station or hardware store providing goods to trade customers, or it is an emergency or critical situation.	• Other businesses can open premises, but customers cannot enter. • Low-risk local recreation activities are allowed. • Public facilities are closed (for example, libraries, museums, cinemas, food courts, gyms, pools, markets). • Gatherings of up to 10 people are allowed but only for weddings, civil union ceremonies, funerals and tangihanga. Physical distancing and public health measures must be maintained. • Healthcare services should use virtual, non-contact consultations if possible. • Inter-regional travel is highly limited, for example, for critical workers, with limited exemptions for others. • People at high risk of severe illness, such as older people and those with existing medical conditions, are encouraged to stay at home where possible, and take additional precautions when leaving home. You may choose to work.
Level 2 – Reduce The disease is contained, but the risk of community transmission remains	• There could be limited community transmission. • There are active clusters in more than one region.	• You can reconnect with friends and family, and socialise in groups of up to 100, go shopping and travel domestically, if following public health guidance. • Keep 2 metres apart from people you do not know in retail stores. Try to keep 2 metres apart from people you don't know when out in public. Keep 1 metre apart in controlled environments like workplaces, where practicable. • No more than 100 people allowed at social gatherings, including weddings, civil union ceremonies, birthdays, funerals and tangihanga. • Businesses can open to the public if following public health guidance, such as physical distancing and record keeping. Alternative ways of working encouraged where possible. • Hospitality businesses must keep groups of customers separated and seated. Maximum of 100 people in a defined space. • Sport and recreation activities are allowed, subject to conditions on gatherings, record keeping, and – where practical – physical distancing. • Public facilities such as museums, libraries and pools can open if they comply with public health measures and ensure 1 metre physical distancing.	• Event facilities, including cinemas, stadiums, concert venues and casinos, can have more than 100 people at a time, provided that there are no more than 100 in a defined space, and the groups do not mix. • Health and disability care services can operate as normally as possible. • It is safe to send your children to schools, early learning services and tertiary education. There will be appropriate measures in place. • People at higher risk of severe illness from COVID-19 (for example, those with underlying medical conditions, especially if not well-controlled, and older people) are encouraged to take additional precautions when leaving home. You may work, if you agree with your employer that you can do so safely. • Passengers and workers in transport stations must keep 1 metre apart, as far as reasonably practicable.
Level 1 – Prepare The disease is contained in New Zealand	• COVID-19 is uncontrolled overseas. • There could be sporadic imported cases. • There could be isolated local transmission in New Zealand.	• There are border entry measures to minimise the risk of importing COVID-19 cases. • Intensive testing for COVID-19 is carried out. • Rapid contact tracing of any positive case is carried out. • Schools and workplaces can open and must operate safely. • There are no restrictions on personal movement, but you are encouraged to maintain a record of where you have been. • There are no restrictions on gatherings, but organisers are encouraged to maintain records to enable contact tracing.	• Stay home if you are sick, report flu-like or COVID-19 symptoms. • Wash and dry your hands, cough into your elbow, do not touch your face. • Avoid public transport or travel if you're sick. • There are no restrictions on workplaces or services, but you are encouraged to maintain records to enable contact tracing. • NZ COVID Tracer QR codes issued by the NZ Government must be displayed in workplaces and on public transport to enable use of the NZ COVID Tracer App for contact tracing. • Face coverings are required on public transport and aircraft, but not inter-island ferries and school buses. Children under 12, passengers in taxis or ride-share services, and people with disabilities or mental health conditions do not have to wear face coverings.

Fig. 10.1 New Zealand COVD-19 alert levels summary2021 (*Note* Source is New Zealand Government's site "Unite Against COVID-19" []. https://covid19.govt.nz/assets/Summary-Table-of-the-COVID-19-Alert-Levels-Updated-17-August)

As early as 22 January 2020, New Zealand's Ministry of Education drew attention to the evolving coronavirus outbreak in China, with New Zealand university Vice-Chancellors increasingly expressing concern that anticipated students from China "might become stranded off-shore" (C. Whelan, personal communication, 31 March 2021). This was due to the large numbers of students from China who normally enrolled in New Zealand universities (54% of all New Zealand's international students in the 2019 academic year), and expectations that they would begin arriving by late January and February for the 2020 academic year.

In 2020, university semester 1 start dates varied from 17 February 2020 (University of Canterbury and Lincoln University) to two weeks later when the University of Auckland and Victoria University of Wellington commenced studies on 2 March. Students were typically encouraged to arrive 1–2 weeks before these dates. Universities that had earlier semester 1 start dates gained a larger proportion of their students than those with start dates just one fortnight later.

On 2 February, New Zealand closed its border to arrivals from mainland China, Iran, northern Italy and South Korea (with the exception of returning New Zealand citizens or permanent residents). From February to March 2020, as cases increased in China, and outbreaks emerged in northern Italy and Iran, the New Zealand university sector, along with its Australian counterparts, actively started to consider the prospect of a temporary pause to in-person learning.

With uncertainty about the trajectory of the outbreak, there was guarded optimism that any disruption to in-person learning would be time-limited to the first half of 2020. While New Zealand universities began the 2020 academic year as expected with in-person learning, they also activated their institutional pandemic preparedness plans and began to make provision for a move to remote learning.

On 23 March, the date New Zealand's Prime Minister announced the introduction of Alert Level 4, the Ministry of Education convened a consultation with representatives of key education sector coordinating organisations, including the Tertiary Education Commission and Universities New Zealand. This gave certainty to the imminent suspension of all face-to-face engagement on New Zealand campuses. The Ministry of Education's COVID-19 Bulletin released that day underscored the Alert Level 4 message that "*All education and research services requiring face to face contact should be suspended immediately. As much delivery as possible should be shifted online, so long as this can be managed by staff working at home*" (Ministry of Education 2020b). Significantly, the same bulletin noted that "*medical research required for combatting COVID-19 is an essential service*", enabling the continuation of university-based research that was crucial for pandemic response (Ministry of Education 2020b).

Within 48 h of the Prime Minister's announcement, New Zealand's eight universities ceased on-site delivery, resulting in an unprecedented, nationwide shift to remote teaching, learning and research. This was in addition to the multitude of financial, administrative, information technology, student support, accommodation and other university services that were required to simultaneously pivot.

Prior to the COVID-19 pandemic, most New Zealand universities had taken steps to integrate blended teaching and learning into their courses and programmes and

had in-house technological capability for online services. Almost all of the country's universities had already invested in cloud-based technologies which facilitated the sudden switch to remote operation under lockdown conditions. The sweeping nature of the 26 March Alert Level 4 provisions still required major operational adjustments that, for most institutions, necessitated a temporary pause in teaching delivery. Despite this, within five weeks (by 30 April 2020), online university teaching for 180,000 students was being implemented nationwide.

Remote learning continued across the country throughout Alert Levels 4, 3 and 2. On 9 June 2020, New Zealand returned to Alert Level 1, followed by the Ministry of Education's guidance that "*all staff and students may return to on-campus activities*" (Ministry of Education 2020d). This advice was interpreted and applied according to individual institutional contexts, with some universities continuing with online delivery for the remainder of 2020.

10.5 An Agile, Cross-Scalar Architecture for Risk Management

The robust response by New Zealand's university enterprise is substantially attributed to existing institutional capability at national and university levels, along with the lessons drawn from the 2010 and 2011 Canterbury earthquakes. This was due in part to the risk management guidance that emerged through the *Leadership and Management of Teaching and Learning* theme considered by the Academic Quality Agency for New Zealand Universities in its 2013–2016 Academic Audit (Matear 2018). Drawing on the insights and experience from the 2010 and 2011 Canterbury earthquakes, the risk management guideline statement explicitly required universities to have "recovery plans and procedures which are designed to facilitate continuity of teaching and learning in instances of infrastructure system failure" (Matear 2018). A synthesis of Cycle 5 academic audit reports also noted that risk management in a New Zealand university context involved planning for diverse and potential risks that included weather events, power outages and pandemics (Matear 2018). Prior to 2020, this nationwide, institutional quality requirement had already been operationally translated into the establishment of emergency management-related structures across the country's universities, accompanied by planning for a range of events, including pandemics.

In the context of the unfolding COVID-19 emergency, New Zealand's university Vice-Chancellors drew on their earlier experience gained in the aftermath of the 2010 and 2011 Canterbury earthquakes. By April 2020, they had requested the AQA to defer the start of the audit phase of Cycle 6 Academic Audit scheduled to begin in 2020. This request sought to seize the opportunity for critical self-review of online teaching approaches during Covid-19 and to draw lessons for the future (AQA 2020a, b). By January 2021, the AQA had received all university COVID-19 self-assessments for compilation and consideration.

The capacity of Aotearoa New Zealand's university sector to respond rapidly and coherently was also enabled through its pre-existing sectoral coordination mechanisms. Following the 2010–2011 Canterbury earthquakes, UNZ's emergency coordination remit had been revised. This adjustment included a specific mandate for mobilising "an emergencies team to respond to long-term events" that affected one or more universities, or to support a specific university facing an enhanced or prolonged emergency need (C. Whelan, personal communication, 31 March 2021). In the context of the COVID-19 pandemic, this mandate provided scope for UNZ to centrally facilitate a coherent, multi-scalar response by New Zealand's university sector.

As early as 3 February 2020, just four days following WHO's declaration of a "Public Health Emergency of International Concern", UNZ's Chief Executive had emailed all New Zealand's university Vice-Chancellors. This communication clarified UNZ's role as the central sectoral coordinating mechanism for nationwide university response to the novel coronavirus. It also requested that Vice-Chancellors identify a key contact-person for ongoing communication. In the ensuing months, UNZ's existing committee structures, comprising representatives of all the country's universities pivoted, convening weekly or two-weekly to discuss and respond to the changing COVID-19 demands and conditions. UNZ's committee structures already included the country's university *Planning Directors* as well as representatives for *Information, Communication and Technology*, *Student Administration and Academic Services*, *Te Kāhui Amokura* and *Komiti Pasifika* (UNZ, n.d.a). In 2020, these, plus other UNZ-facilitated coordinating mechanisms grew to 30 functioning subcommittees to support a coherent national university response (C. Whelan, personal communication, 31 March 2021).

Among the UNZ interventions that advanced pandemic management across Zealand's universities and other higher education institutions, was its engagement with government to develop unifying *Guidelines for Tertiary Education Organisations on how to operate under different Alert Levels* (Fig. 10.2). This framework not only enabled uniformity within the tertiary education enterprise; it also ensured alignment of university response with New Zealand's over-arching Alert Levels system as well as with other sectors.

10.6 The University as Frontline Responder

In many countries, the COVID-19 "frontline" was represented through the wrenching humanitarian and life-saving efforts of health workers in intensive care hospital settings. This portrayal, however, did not resonate with the lived experience of Aotearoa New Zealand. With only 126 COVID-19-related hospital admissions to 31 March 2021, it was a vigorous, expanded, cross-sectoral public health emergency and border workforce that held the country's COVID-19 frontline, underpinned by decisive national leadership, clear risk communication and robust science.

The crucial role played of science, substantially led by university-based researchers has been resoundingly acknowledged in New Zealand's effective

Detail on the **public health control measures** for TEOs at Alert Level 2, along with a set of FAQs, can be found here.

Updated as at 17 November 2020	Overarching principles for TEOs	What this means for...			
		Teaching and learning	Conducting research	Accommodation and student support	Campus operations and management
Level 1 - Prepare **Status:** *The disease is contained in New Zealand* • Wearing a face covering is mandatory on all public transport in to, out of, or within Auckland, and on all domestic flights across New Zealand, from Thursday 19 November. More information, including exemptions, can be found here. **The Golden Rules for everyone at Alert Level 1:** 1. If you're sick, stay home. Don't go to work or school. Don't socialise. 2. If you have cold or flu symptoms call your doctor or Healthline and make sure you get tested. 3. Wash your hands. Wash your hands. Wash your hands. 4. Sneeze and cough into your elbow, and regularly disinfect shared surfaces. 5. If you are told by health authorities to self-isolate you must do so immediately. 6. If you're concerned about your wellbeing or have underlying health conditions, work with your GP to understand how best to stay healthy. 7. Keep track of where you've been and who you've seen to help contact tracing if needed. Use the NZ COVID Tracer app as a handy way of doing this. 8. Businesses should help people keep track of their movements by displaying the Ministry of Health QR Code for contact tracing. 9. Stay vigilant. There is still a global pandemic going on. People and businesses should be prepared to act fast to step up Alert Levels if we have to. 10. People will have had different experiences over the last couple of months. Whatever you're feeling — it's okay. Be kind to others. Be kind to yourself.	**Principles for TEOs under Alert Level 1** • All on-site activities at tertiary education facilities can resume as normal, including classes, lectures, labs, workshops, tutorials, noho, meetings, etc. • All staff and students should return to on-campus activities. • TEOs (along with all businesses and services) are required to display the official NZ COVID Tracer QR code posters in a prominent place at or near the main entrances, even at Alert Level 1. This helps enable individuals (i.e. staff, students, and visitors) to keep track of where they have been. • TEOs may also continue to collect contact tracing information through other mechanisms so long as they protect peoples' privacy and safety. • TEOs are not required to maintain physical distancing. • Remote learning and teaching systems should be maintained in case of a move to a higher alert level. • TEOs should be ready to move up alert levels at short notice (i.e. be ready to implement the required public health control measures of each level) • If a staff or student is concerned about their wellbeing, or has underlying health conditions, they should work with their GP or other health professional to understand how best to stay healthy.	• All teaching and learning activities may run as normal, with no COVID-19-related restrictions other than what would normally be required under the Health and Safety Act and relevant Worksafe regulations. • This means that classes, lectures, labs, workshops, tutorials, noho (including overnight noho marae), close-contact courses, workplace-based learning, pastoral care, and meetings, etc. may all run as normal. • Guidance for TEOs on how to run **on-site examinations** at different Alert Levels can be found here	• All research and related activities are allowed as normal, with no COVID-19-related restrictions other than what would normally be required under the Health and Safety Act and relevant Worksafe regulations.	• Student accommodation, such as hostels and halls of residence, may operate as normal, with no COVID-19-related restrictions other than what would normally be required under the Health and Safety Act and relevant Worksafe regulations, and the Pastoral Care Code. • Maintaining 'bubbles', physical distancing, restricting visitors or social events, etc. are not required for student accommodation. • Tertiary accommodation providers are required to display the official NZ COVID Tracer QR code posters in a prominent place at or near the main entrances of accommodation facilities. • Shared kitchens and communal areas are allowed to open as normal. • Students may travel domestically as normal, though strict border control measures will still be in place for anyone entering New Zealand, including students or staff. • Student counselling & health services are allowed to operate as normal.	• All operations and management staff are allowed on site, as normal. • On-campuses businesses such as gyms, pharmacies, cafes, restaurant, etc. may operate as normal, with no COVID-19-related restrictions other than continuing to use NZ COVID Tracer QR Codes, and what would normally be required under the Health and Safety Act and relevant Worksafe regulations, and the Pastoral Care Code. • Libraries, recreation areas (e.g. sports grounds, tennis courts etc.), etc. may operate as normal. • Staff may travel domestically as normal, though strict border control measures will still be in place for anyone entering New Zealand, including students or staff.

Fig. 10.2 Guidelines for Tertiary Education Organisations on how to operate under different Alert Levels (Level 1 only) (*Note* Source: Ministry of Education [2020d] https://www.education.govt.nz/assets/Uploads/final-final-detailed-tertiary-guidelines-for-alert-levels.pdf)

COVID-19 response (Baker et al. 2020b; Geoghegan et al. 2021; Hendy et al. 2021; Jefferies et al. 2020; Kvalsvig and Baker 2021; Wilson 2020). This has extended across fields including public health, communicable diseases, genomics, modelling and immunology (Geoghegan et al. 2021). Active science engagement also underpinned national policy advice and has been prominent in public-facing risk communication (Wilson 2020).

It was determined science advocacy, underwritten by epidemiology and rigorous mathematical modelling that redirected New Zealand's COVID-19 strategy from an initial mitigation response for influenza outbreaks to an ambitious elimination strategy geared for COVID-19's specific transmission dynamics (Baker et al. 2020a; Jefferies et al. 2020). This science advice was based on mathematically modelled evidence that projected New Zealand hospital intensive care unit capacity would be overwhelmed if rigorous border controls, quarantine, physical distancing and other measures were not rapidly instituted (James et al. 2020; Wilson et al. 2020).

The stature of this expertise was viewed as so central to the national response that by 27 March 2020, a "COVID-19 Modelling Workstream" was embedded in the National Crisis Management Centre (NCMC) (Hendy et al. 2021). This provided government with the necessary evidence to inform an agile operational response. It also offered daily and direct evidence to guide the Department of the Prime Minister and Cabinet (DPMC) on the health and transmission outcomes of the possible policy scenarios being considered (Hendy et al. 2021).

The robustness of New Zealand's public health response was also enabled by the country's rapid advancement of its COVID-19 genomic sequencing capability. This capacity fast-tracked understanding of the specific pathways of viral spread, especially when combined with epidemiological and mathematical modelling data and augmented with geographic information (Geoghegan et al. 2021). These outputs, often in real-time, were crucial for informing rapid government public health responses, strengthening understanding of the effectiveness of border control measures and for identifying community "transmission hotspots" for enhanced testing (Geoghegan et al. 2021).

Effective risk communication has been underlined as central to New Zealand's COVID-19 response (Jamieson 2020; Bloomfield 2021). While the government implemented a visible, wide-ranging communication strategy, the country's scientists played prominent roles both in augmenting government messaging and by adding a vigorous and critical voice. In this context, the risk communication partnership of microbiologist Dr. Siouxie Wiles and The Spinoff's illustrator Toby Morris was particularly noteworthy (Jamieson 2020). It provided evidence-based and highly accessible "cartoon-style" information on measures that the public could take to reduce spread (The Spinoff 2020, 19 May).

These examples of energetic science engagement throughout Aotearoa New Zealand's COVID-19 response reinforce the role of the university as a crucial frontline actor in complex, multi-scalar emergencies. Along with other instances, they underscore the value of university-based capability and expertise as resources integral to the frontline public health emergency response.

10.7 New Challenges—Existing Vulnerabilities

The sudden and sweeping changes taken globally by tertiary education institutions in response to COVID-19 have been described as the "Great Pivot Online". They reflect a massive, sudden shift to distance learning, which by April 2020, had resulted in the physical closure of campuses in 175 countries (World Bank 2020b). However, in addition to the technological and pedagogical challenges posed, the sudden transition for students worldwide foregrounded issues of academic, social, financial and physical equity. This was particularly the case for low-income or at-risk students, whose pre-COVID-19 financial or social circumstances may have already been precarious, and whose access to social and other support networks was now suddenly disrupted by campus closures.

In this context, while the sudden transition to online teaching and learning highlighted the overall agility of New Zealand's university sector, it also represented a major upheaval for both students and staff. With a complex student profile comprising international and domestic students, universities faced diverse challenges supporting students in the presence of tight border restrictions, highly constrained subnational mobility and tough physical distancing measures that initially limited contact to a single household or comparable "bubble". The introduction of Level 4 "lockdown" measures from 26 March 2020 gave domestic students only until midnight on 27 March to return home. Level 4 measures also disrupted access to part-time employment that was essential to many student livelihoods. International students saw border restrictions tighten and international flights dwindle and vanish completely, limiting their options to return home.

Over the following months, individual universities within New Zealand, as well the country's national higher education bodies, adopted support measures for both domestic and international students. Central to this was the provision of regular COVID-19 updates, given the potential for rapid change in alert levels. This information was particularly important for international students due to difficulties imposed by travel restrictions and limited availability of flights.

In response, the Tertiary Education Commission and Ministry of Education routinely released COVID-19 bulletins for tertiary education providers and students to confirm changing policies and procedures. Illustrations of these include the 30 March 2020 announcement of a freeze on rental price increases (TEC 2020a), the 2 April 2020 update clarifying processes for international students to repatriate (TEC 2020b) and the 6 April 2020 information on the "Lowdown" website for mental health support (TEC 2020c). On 14 April 2020, both sites released information on a short-term tertiary domestic package of financial support that sought to "ensure income continuity and adequacy for tertiary domestic students during the Covid-19 outbreak" (TEC 2020d).

National funding was released to tertiary institutions for students with limited or no access to appropriate devices or internet, as well as those who needed access to specific operating systems/programmes or technical support (TEC 2020e). Resources from the "Technology Access Fund for Learners" (TAFL) were made available to

tertiary institutions, including universities, to specifically address issues of digital equity for students without access to appropriate technology for remote learning.

10.8 Navigating Complex Needs—Students, Staff, Sustainability

Despite government financial assistance, expanded online mental health services and intensified university support, many students and university staff experienced real difficulties in 2020. Early surveys conducted by both the New Zealand University Students Association (NZUSA) and Te Mana Ākonga (National Māori Students Association) provided snapshots on the obstacles students faced. Through its online survey of 485 students, NZUSA foregrounded issues on finances and wellbeing, institutional response and government assistance (James 2020). 87% or more of those surveyed reported increased study-related stress levels, with difficulties due to the need for more self-directed, rather than classroom-style learning. This particularly applied to students enrolled in programmes that involved group participation (e.g. dance) or courses requiring "hands-on" learning or use of equipment. Consistent with findings elsewhere, survey results underlined the mental health challenges associated with social isolation. They also highlighted the intense financial pressures faced by many students due to lost employment or reduced work hours. Responses included comments on the challenges of interpreting complex university communications that were viewed as "confusing" and "incomprehensible" (James 2020).

Similar observations were made by Te Mana Ākonga through an online survey of Māori students during Alert Level 3 (April–May 2020). Of the 351 eligible student responses, 25% underlined inadequate access to strong, reliable WiFi or internet, while 83.6% reported being more worried about their academic progress (Akuhata-Huntington 2020).

Most of the Māori students surveyed were living with whānau (family) during lockdown conditions. However, only 25% indicated that these arrangements included someone able to offer financial support. This was despite approximately 17% reporting that they had to stop working during Alert Level 4. With constrained access to work-related income, 45% of respondents acknowledged the importance of student allowances or student loans. And while there was positive feedback on access to and quality of tertiary Māori support services, the survey indicated higher numbers of Māori students who felt more anxious, sad, lonely and stressed (Akuhata-Huntington 2020).

Such challenges were not limited to students. Staff surveys in May and August 2020 by New Zealand's Te Hautū Kahurangi | Tertiary Education Union (TEU) also foregrounded major disruptions and stresses for teaching staff. The first survey highlighted the intense and overwhelming pressures felt by staff in the sudden switch to online teaching delivery, as they grappled with technology and new teaching

delivery modes. It also reflected wide-ranging and compounding disruptions to work-family balance, due to unrelenting demands in juggling child-care and other family responsibilities while teaching from home (Sedgwick 2020a; Sedgwick 2020b).

The second 2020 survey indicated a rising proportion of staff who reported feeling "very stressed". However, in addition to intense workload pressures noted earlier, respondents increasingly identified challenges in "top-down" communication behaviour from senior management and anxieties about their future employment. Specifically, the second report highlighted that staff concerns refocused on "restructuring, job insecurity, redundancy threats, pay and staff cuts, and unrealistic work expectations" (Sedgwick 2020b). These shifting perceptions and concerns were unsurprising, as in 2021, the sector was forced to pivot again, as it anticipated a sharp financial shock due to markedly reduced international student earnings.

In 2018, university income from international education contributed 1.2% to all New Zealand's exports of goods and services (UNZ, n.d.b). In 2019, this was reflected in the enrolment of 33,900 international students in New Zealand universities, comprising 19% of the student body (Ministry of Education 2020a). However, by April 2020, the total number of international students in-country fell by more than 50% to only 17,570 (Gerritsen 2020). While this reduction partly reflected the effect of expiring student visas and students returning home on repatriation flights, it also signalled a grave financial "early warning" to New Zealand's higher education sector. This is because 13–15% of New Zealand university revenue is normally drawn from international students (C. Whelan, personal communication, March 31, 2021; Gerritsen 2021).

Despite hopes that border restrictions would ease later in 2020 or even by early 2021, this did not eventuate. As a result, New Zealand's university sector approached 2021 with the expectation of no more than 10,000 international students, down by two-thirds of normal enrolments. Materially, the resulting reduction in earnings translated into 700 university job losses, including through voluntary leaving, voluntary redundancies, as well as forced redundancies (Gerritsen 2021; C. Whelan, personal communications, 2021).

In reality, 2021 domestic and international student enrolments were higher than expected—with the enrolment of 12,000 international students, including 3,500 still studying offshore (C. Whelan, personal communication, 31 March 2021). While this result was more positive than the earlier 2021 forecasts, it still fell short in cumulatively countering the overall drop in income experienced over the COVID-19 period.

10.9 Navigating Future Risk

COVID-19 challenged Aotearoa New Zealand's university enterprise with a complex, protracted emergency, characterised by uncertain spatial and temporal dynamics. The

sector's vigorous capability to adjust was in part enabled by its prior disaster experience. This was reflected in its prompt mobilisation of existing multi-scalar mechanisms to coordinate and align a coherent response. The rapid, committed engagement by university-based researchers to inform science-based decision-making further underlined the vital role of university as a frontline responder in public health emergencies.

Yet, COVID-19 also laid bare many pre-existing sectoral vulnerabilities. Centrally, it foregrounded the effect of pre-existing structural inequities that disadvantaged students due to socio-economic and digital access barriers to higher education. It also underlined an urgency to address the wellbeing and support needs of students managing difficult and interlinked, academic, financial and personal stressors.

Consistent with the disaster recovery principle of "building back better", COVID-19 has provoked Aotearoa New Zealand's university sector to strengthen its risk management capability. At national level, this is reflected in collaboration with government on the future shape of international education, including prospects for diversifying markets and reducing financial risk from future pandemics. Insights from the response have prompted discussion to better integrate and embed (where appropriate) online learning within existing teaching approaches and pedagogy. They have also escalated policy imperatives to address structural inequalities, mental health and social wellbeing needs across a diverse student constituency.

The SARS-COV-2 public health emergency will not be Aotearoa New Zealand's last cascading disaster, nor pandemic threat. COVID-19 has unlocked a suite of new institutional agilities in New Zealand's universities and foregrounded the role of university as a frontline science responder in times of duress. These attributes constitute crucial resources in a world of growing uncertainty.

Acknowledgements The author is most grateful for the support extended by Sheelagh Matear and Chris Whelan in compiling this contribution. She also acknowledges the insight and assistance of senior management staff at Auckland University of Technology.

References

Akuhata-Huntington Z (2020) Impacts of the COVID-19 lockdown on Maori University students. Te Mana Ākonga. http://hdl.voced.edu.au/10707/543367

AQA (2020a) Quality enhancement. https://www.aqa.ac.nz/enhancing-quality

AQA (2020b) News: cycle 6 academic audit updates. https://www.aqa.ac.nz/sites/all/files/JUNE%20Newsletter%202020_0.pdf

Baker MG, Kvalsvig A, Verrall AJ, Telfar-Barnard L, Wilson N (2020a) New Zealand's elimination strategy for the COVID-19 pandemic and what is required to make it work. N Z Med J 133(1512):10–14

Baker M, Wilson N, Anglemyer A (2020b) Successful elimination of Covid-19 transmission in New Zealand. N Engl J Med 383(e56). https://doi.org/10.1056/NEJMc2025203

Bloomfield A (2021) COVID-19, 20, 21: lessons from New Zealand's 2020 response for 2021 and beyond. N Z Med J 134(1529):7–9

Cutter SL (2018) Compound, cascading, or complex disasters: what's in a name? Environ Sci Policy Sustain Dev 60(6):16–25. https://doi.org/10.1080/00139157.2018.1517518

ESR (2020) Measles weekly report week 6: 1–7 February 2020. https://surv.esr.cri.nz/PDF_surveillance/MeaslesRpt/2020/measlesReport20200210.pdf

Geoghegan JL, Moreland NJ, Le Gros G, Ussher JE (2021) New Zealand's science-led response to the SARS-CoV-2 pandemic. Nat Immunol 22:262–265. https://doi.org/10.1038/s41590-021-00872-x

Gerritsen J (2020) Covid 19 coronavirus: foreign student numbers down, immigration stats show. Radio New Zealand. https://www.nzherald.co.nz/nz/covid-19-coronavirus-foreign-student-numbers-down-immigration-stats-show/WNWLDJVUJUTMXHIKHDBQRLC67I/

Gerritsen J (2021) Covid 19 coronavirus: international student downturn costs 700 university jobs. Radio New Zealand. https://www.nzherald.co.nz/nz/covid-19-coronavirus-international-student-downturn-costs-700-university-jobs/SIV3FMRU43RBVM6VDMMFWXSSAQ/

Helbing D (2013) Globally networked risks and how to respond. Nature 497:51–59. https://doi.org/10.1038/nature12047

Hendy S, Steyn N, James A, Plank MJ, Hannah K, Binny RN, Lustig A (2021) Mathematical modelling to inform New Zealand's COVID-19 response. J Roy Soc N Z 51(S1). https://doi.org/10.1080/03036758.2021.1876111

James J (2020) COVID-19 and tertiary students: the impact on the wellbeing, finance, and study of students at tertiary institutions in Aotearoa New Zealand. New Zealand University Students Association. https://static1.squarespace.com/static/5f0515b1b1a21014b5d22dd6/t/5fa218b297ec03254a8fc9b3/1604458682311/COVID-19+and+Tertiary+Students+The+impact+on+the+wellbeing%2C+finance%2C+and+study+of+students+at+tertiary+institutions+in+Aotearoa+New+Zealand+.pdf

James A, Hendy SC, Plank MJ, Steyn N (2020) Suppression and mitigation strategies for control of COVID-19 in New Zealand. https://doi.org/10.1101/2020.03.26.20044677

Jamieson T (2020) "Go hard, go early": preliminary lessons from New Zealand's response to COVID-19. Am Rev Public Adm 50(6–7):598–605. https://doi.org/10.1177/0275074020941721

Jefferies S, French N, Gilkison C, Graham G, Hope V, Marshall J, McElnay C, McNeill A, Muellner P, Paine S, Prasad N, Scott J, Sherwood J, Yang L, Priest P (2020) COVID-19 in New Zealand and the impact of the national response: a descriptive epidemiological study. Lancet Public Health 5:e612–23. https://doi.org/10.1016/S2468-2667(20)30225-5

Jones A (2020) How did New Zealand become COVID-free? BBC News. https://www.bbc.com/news/world-asia-53274085

Kvalsvig A, Baker M (2021) How Aotearoa New Zealand rapidly revised its Covid-19 response strategy: lessons for the next pandemic plan. J R Soc N Z 51(sup1):S143–S166. https://doi.org/10.1080/03036758.2021.1891943

Matear S (2018) Process review of cycle 5 academic audit. Academic Quality Agency of New Zealand Universities. See GS 5, p 13. https://www.aqa.ac.nz/sites/all/files/Process%20Review%20of%20Cycle%205%20Academic%20Audit.pdf

Ministry of Education (2020a) Education counts: summary overview of tertiary education. Data tables on learners in tertiary education and tertiary education providers: provider summary tables. https://www.educationcounts.govt.nz/topics/tertiary

Ministry of Education (2020b) COVID-19 update for tertiary providers: 23 March. https://www.education.govt.nz/news/covid-19-update-for-tertiary-providers-23-march/

Ministry of Education (2020c) COVID-19 update for tertiary providers: 6 April. https://www.education.govt.nz/further-education/covid-19-bulletins-for-tertiary-providers-and-students/

Ministry of Education (2020d) Guidelines for tertiary education organisations on how to operate under different alert levels. https://www.education.govt.nz/assets/Uploads/final-final-detailed-tertiary-guidelines-for-alert-levels.pdf

Ministry of Education (n.d.) Tertiary administration. https://www.education.govt.nz/further-education/tertiary-administration/

Ministry of Health (2021a) COVID-19: case demographics. https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-data-and-statistics/covid-19-case-demographics. Accessed 1 Apr 2021

Ministry of Health (2021b) COVID-19: source of cases. https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-data-and-statistics/covid-19-source-cases. Accessed 1 Apr 2021

New Zealand Government (2020) New Zealand to send further firefighter support to Australia. https://www.beehive.govt.nz/release/new-zealand-send-further-firefighter-support-australia#:~:text=Since%20late%20October%202019%2C%20157,assistance%2C%E2%80%9D%20Tracey%20Martin%20said

New Zealand Government (2021) New Zealand COVID-19 alert levels summary. Unite against COVID-19. https://covid19.govt.nz/assets/Summary-Table-of-the-COVID-19-Alert-Levels-Updated-17-August

Pescaroli G, Alexander A (2015) A definition of cascading disasters and cascading effects: going beyond the "toppling dominos" metaphor. GRF Davos Planet@Risk 3(1):58–67

Radio New Zealand (RNZ) (2021) Timeline: the year of COVID-19 in New Zealand. https://www.rnz.co.nz/news/national/437359/timeline-the-year-of-covid-19-in-new-zealand

Renn O (2021) New challenges for risk analysis: systemic risks. J Risk Res 24(1):127–133. https://doi.org/10.1080/13669877.2020.1779787

Sedgwick C (2020a) Tertiary lives COVID-19: a survey on the impact of COVID-19 on tertiary education staff. Tertiary Education Union: Te Hautū Kahurangi. https://assets.website-files.com/5c6dcbdefb133660ed1ad071/5eb8adc522342ac1db18724d_Tertiary%20Lives%20COVID-19%20Survey%2012%20April%202020%20(1).pdf

Sedgwick C (2020b) Tertiary lives COVID-19: part II: a follow-up survey on the impact of COVID-19 on tertiary education staff. Tertiary Education Union: Te Hautū Kahurangi. https://assets-global.website-files.com/5c6dcbdefb133660ed1ad071/5f751bd9e0c1656012af6c9e_TEU%20COVID-19%20Pulse%20Survey%20October%202020.pdf

Shand M (2020) Whakaari/White Island eruption death toll rises to 22 as anniversary nears. The Stuff. https://www.stuff.co.nz/bay-of-plenty/300167184/whakaariwhite-island-eruption-death-toll-rises-to-22-as-anniversary-nears

TEC (2020a) Update 30 March 2020: update for domestic tertiary students. https://www.tec.govt.nz/about-us/covid-19-coronavirus-information/archived-covid-19-information/

TEC (2020b) Update 2 April 2020: update for tertiary providers and international students. https://www.tec.govt.nz/about-us/covid-19-coronavirus-information/archived-covid-19-information/

TEC (2020c) Update 6 April 2020: answers to domestic tertiary students' questions. https://www.tec.govt.nz/about-us/covid-19-coronavirus-information/archived-covid-19-information/

TEC (2020d) Update 14 April 2020d: ensuring continuity and adequacy of student support. https://www.tec.govt.nz/about-us/covid-19-coronavirus-information/archived-covid-19-information/

TEC (2020e) Government announces $20 million technology access fund for tertiary learners. https://www.tec.govt.nz/news-and-consultations/archived-news/government-announces-20-million-technology-access-fund-for-tertiary-learners/

The Spinoff (2020) The bumper Toby Morris & Siouxsie Wiles Covid-19 box set. https://thespinoff.co.nz/media/19-05-2020/the-great-toby-morris-siouxsie-wiles-covid-19-omnibus/

Thornton J (2020) In the aftermath: the legacy of measles in Samoa. The Lancet 395(10236):1535–1536

UNDRR (2019) Global assessment report on disaster risk reduction. United Nations Office for Disaster Risk Reduction (UNDRR) Geneva, Switzerland, pp 36–40

Universities New Zealand (UNZ) (n.d.a) Universities New Zealand committees and working groups. https://www.universitiesnz.ac.nz/about-universities-new-zealand/universities-new-zealand-committees-and-working-groups

Universities New Zealand (UNZ) (n.d.b.) Advancing international education. https://www.universitiesnz.ac.nz/sector-research/advancing-international-education

WHO (2020a) New Zealand takes early and hard action to tackle COVID-19. https://www.who.int/westernpacific/news/feature-stories/detail/new-zealand-takes-early-and-hard-action-to-tackle-covid-19

WHO (2020b) Coronavirus disease 2019 (COVID-19). Situation Report—42. https://www.who.int/docs/default-source/coronaviruse/situation-reports/2020b0302-sitrep-42-covid-19.pdf?sfvrsn=224c1add_2

WHO (2021a) Weekly epidemiological update on COVID-19—30 March 2021. https://www.who.int/publications/m/item/weekly-epidemiological-update-on-covid-19---31-march-2021

WHO (2021b) WHO COVID-19 dashboard. World Health Organization, Geneva. https://covid19.who.int/. Accessed 31 Mar 2021b

WHO/UNICEF (2020) Measles outbreak in the Pacific—Situation Report No. 10. Joint WHO/UNICEF Measles Outbreak Response and Preparedness in the Pacific. https://www.who.int/docs/default-source/wpro---documents/dps/outbreaks-and-emergencies/measles-2019/20200108-measles-pacific-who-unicef-sitrep-106cd003b8c83042dd81fb17d62dc3f35c.pdf?sfvrsn=657d0d88_0

Wilson S (2020) Pandemic leadership: lessons from New Zealand's approach to COVID-19. Leadership 16(3):279–293

Wilson N, Telfar Barnard L, Kvalsvig A, Baker M (2020) Rationale for border control interventions and options to prevent or delay the arrival of Covid-19 in New Zealand: final commissioned report for the New Zealand Ministry of Health. https://www.health.govt.nz/system/files/documents/publications/final_report_for_moh_-_border_control_options_for_nz_final.pdf

World Bank (2020a) World Bank provides US$5.1 million for Samoa COVID-19 response. https://www.worldbank.org/en/news/press-release/2020/03/27/world-bank-provides-us5-1m-for-samoa-covid-19-response

World Bank (2020b) The COVID-19 crisis response: supporting tertiary education for continuity, adaptation, and innovation. https://documents1.worldbank.org/curated/en/621991586463915490/The-COVID-19-Crisis-Response-Supporting-Tertiary-Education-for-Continuity-Adaptation-and-Innovation.pdf

Chapter 11
Applying New Technologies and Innovation in Taiwan

Chih-Long Pan and Jet-Chau Wen

Abstract The Coronavirus Disease 2019 (COVID-19) pandemic has an enormous impact on every aspect of activities in our daily lives, especially on school education. In order to prevent contagious infections of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in classrooms, some policies and strategies were raised in Taiwanese campuses to minimize the COVID-19 effects on students' learning. A vital guiding dogma from the Ministry of Education in Taiwan is "classes suspended but learning continues;" therefore, strategies, technologies, and innovation should be employed to follow the guidelines. In the mitigation stage of disaster management, school administrative units focused on drawing up emergency plans for fighting against the pandemic. Also, the dynamic states of overseas students were traced before the beginning of a new semester, and the health conditions, travel histories in vacation, and other epidemic matters were followed up via e-mails and phone calls. All the collected information will be forwarded to the relevant teachers to modify the lesson plans. Teachers should take courses and workshops to learn the skills of remote teaching in the preparedness phase. The anti-epidemic measures were also prepared in this phase. In the response phase, all campus members needed to comply with the government's orders and the campus emergency plans. The courses were implemented by teaching in the classroom, synchronizing on the Internet meeting software, and recording the lessons for a delayed study. Artificial intelligence (AI) techniques were developed and utilized throughout campuses to facilitate teaching processes, protect campus members, and monitor academic safety. In this chapter, the

C.-L. Pan
Bachelor Program in Interdisciplinary Studies, College of Future, National Yunlin University of Science and Technology, No. 123, Section 3, University Road, Douliu, Yunlin 640, Taiwan, ROC

J.-C. Wen (✉)
Research Center for Soil & Water Resources and Natural Disaster Prevention (SWAN), National Yunlin University of Science and Technology, Douliu, Yunlin, Taiwan
e-mail: wenjc@yuntech.edu.tw

Department and Graduate School of Safety, Health, and Environmental Engineering, National Yunlin University of Science and Technology, No. 123, Section 3, University Road, Douliu, Yunlin 640, Taiwan, ROC

T. Izumi et al. (eds.), *Safety and Resilience of Higher Educational Institutions*,
Disaster Risk Reduction,
https://doi.org/10.1007/978-981-19-1193-4_11

anti-epidemic policies and laws on the educational aspect in Taiwan will be introduced first. Pathways for receiving and transmitting the transparent and real-time COVID-19 pandemic information and regulations shall also be highlighted. The innovative AI technology employed in campuses and classrooms plays a significant role in educational settings, and this topic will be well discussed in the last section. Conclusively, the COVID-19 pandemic gives education providers a new lesson that forces stakeholders to brainstorm the disaster relief context in campus response and management.

Keywords Higher Educational Institute · COVID-19 pandemic · Disaster management · E-learning · Distance education

11.1 Introduction

Since the end of 2019, a rampant coronavirus disease, abbreviated as COVID-19, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was transmitted globally. Based on the COVID-19 dashboard of the World Health Organization (WHO) on 19 March 2021, 121,464,666 confirmed cases were reported, and 2,684,093 persons lost their lives due to the infection (WHO 2020a, b). The COVID-19 pandemic struck most aspects of daily activities, such as the economy, tourism industry, global supply chain, et al. (Baum and Hai 2020; Guan et al. 2020; McKibbin and Fernando 2020). It goes without saying that education also has an extreme impact on sustainable learning (Cheng, Wang, et al. 2020; Pragholapati 2020). Educational activities were inhibited throughout the world by the pandemic to curb the contagious infection. In addition, the educational institutes were temporarily closed by most governments to contain the transmission of the COVID-19 pandemic in the campuses. Over 94% of the students in the world were impacted due to the nationwide closures, and nearly 1.6 billion learners in more than 190 countries and all continents were affected (De Giusti 2020). Fortunately, since the confirmed cases, as well as mortality rate, were relatively low in Taiwan, all levels of schools have no closure during the COVID-19 pandemic. Nevertheless, a lot of policies and technologies are adopted to prevent SARS-CoV-2 infection in the classrooms.

Based on the data of Taiwan's Ministry of Education (MOE) in the 2019 academic year (1 August 2019 to 31 July 2020), the number of students in 158 higher educational institutions (HEIs) was 1,129,231 and had engaged 28.49% of the overall educational population. There were 23,242 international students, including 10,677 students (45.94%) from Hong Kong and Macao, China. During the COVID-19 pandemic, how to continue the study of international students will be one of the vital and pressing challenges for the HEIs of Taiwan. In order to keep equality of learning for the international students, technologies and innovation were employed for such purposes. In addition, classrooms, offices, halls, auditoriums, gymnasiums,

libraries, dormitories, etc., in HEIs are the potential places of cluster infection. Therefore, the educational administrative sectors were in a dilemma of protecting the safety and keeping learning right.

The HEIs are like a small society, in which students and staff are gathered for the purpose of school learning. Factors that promote the COVID-19 might be found on campuses if the HEI members do not follow adequate anti-epidemic measures. How to protect the HEI members and keep continuous learning would be one of the major challenges during the COVID-19 pandemic. In this chapter, we will share Taiwan's experiences in HEIs against the epidemic. The issued educational policies and regulations for teachers and students will be collected and discussed in the first section. Second, a pandemic monitoring system and information integration and management can be introduced to provide a full spectrum of pandemic matters in HEIs. Besides, technologies and innovation, especially artificial intelligence (AI), shall be highlighted in the subsequent section for supporting teaching and learning. The substantial actions for combating the COVID-19 pandemic in the classrooms will be depicted in detail in the last section.

11.2 Policy and Regulation

In Taiwan, the MOE governs all educational affairs; therefore, in the COVID-19 pandemic, all members in HEIs should follow the policies and regulations that the MOE announced to continue the study of students and maintain the safety of everyone on campus. "Education is a fundamental human right" is the central dogma of the MOE, so "classes suspended but learning continues" is the vital policy during the pandemic. In order to keep the principals, the MOE promulgated a plenty of policies and regulations to ensure that learning in schools is safe and carefree. These could be classified into three major categories: mitigation, preparedness, and response, based on the strategy of disaster management. The significant measures in HEIs are depicted in Fig. 11.1 and elaborated on the following paragraphs.

11.2.1 Mitigation

In this phase, the MOE has accomplished some strategies to inhibit the carriers from entering the HEIs. The COVID-19 pandemic outbreak was at the end of 2019, and this time interval was during the ongoing semester (first semester of 2019; 1 August 2019 to 31 January 2020). The Central Epidemic Command Center (CECC) of the Ministry of Health and Welfare (MOHW) is the sole sector of the central government for all epidemic affairs; therefore, the MOE will follow the directions of CECC to apply to the HEIs. The campus members should take some self-protection measures, such as wearing surgical masks, washing hands, employing disinfectants (75% alcohol, bleach, etc.), and detecting body temperature. Using the National Yunlin University

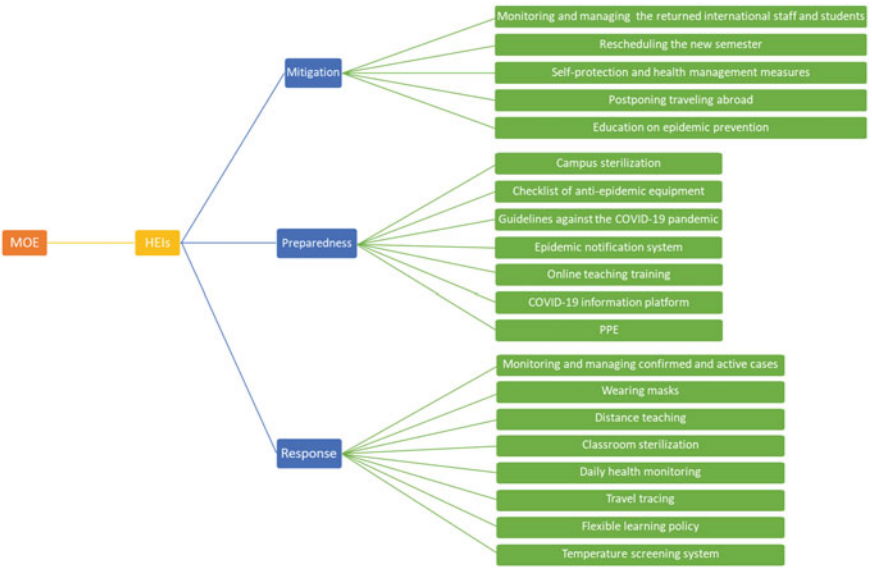


Fig. 11.1 The policies and regulations of the Minister of Education in Taiwan

of Science and Technology (YunTech) as an example, all school members should upload the health conditions every day, symptomatic or asymptomatic, to the COVID-19 information platform by scanning the QR codes after taking body temperatures. Since the COVID-19 information platform has a log-in process, the server will collect the personal information and upload health conditions to screen symptomatic cases. Once the suspected ones are selected, they will be sent to the temporary health station to wait for the ambulance transportation to the hospitals for further screening.

The participation of international conferences and activities abroad has been highly restricted or even forbidden for the faculty and students to avoid the SARS-CoV-2 infection. It has a strong impact that not only scheduled itineraries have interfered, but also the academic development has been slowed down in that time. Moreover, the commencement of the second semester of 2019 (1 February 2020–31 July 2019) was postponed for one or two weeks to do some preparation for receiving the incoming international students. In order to control SARS-CoV-2 carriers accessing the HEIs, the MOE was strictly monitoring and managing the returned international staff and students by quarantining at least 14 days; however, the HEIs provided necessary assistance and support to the isolators.

Epidemic Protection Teams (EPTs) are established in HEIs in Taiwan to handle epidemic affairs on campuses and are the main window to the MOE. The core members of the EPT consist of the President, vice president, first-level supervisors, administrators, and medical staff.

The operation of the EPTs is similar to the Incident Command System in the fire departments or hospitals. In an emergency situation, they are decision-makers to

respond to the COVID-19 pandemic, while, in an available time, the EPTs deliver the necessary self-protection skills and explicit epidemic information to all members in HEIs.

11.2.2 Preparedness

In the theory of disaster management, preparedness is the fundamental element to a successful response. That is to say, the transmission of the SARS-CoV-2 can be impeded in the HEIs only by well-preparedness. The specific approaches in most of Taiwan's HEIs will be introduced in this section. The MOE has issued "Guidelines of Severe Acute Respiratory Syndrome Coronavirus 2 Control in Higher Educational Institutes (3rd)" on 2 March 2020 to render the primary instructions to the preparedness matters. In this phase, organizing EPTs in advance is a critical task for preparing the epidemic response. The organizational diagram of an EPT is shown in Fig. 11.2. The President leads the EPTs to be a dominant decision maker, and the vice presidents and chief secretory act as Convener Panel to call the EPT members to cope with the COVID-19 pandemic matters. The health section is a vital medical consultation sector to provide professional epidemic information and standard operation protocols when facing a pandemic. The campus safety and security center will also collect the COVID-19 cases on the campus to notify the MOE and relative central offices of the epidemic conditions therein to facilitate the MOE's understanding of the status of all HEIs. The Contact window will establish an epidemic contact channel with the local and central health administrative units to receive the official epidemic information

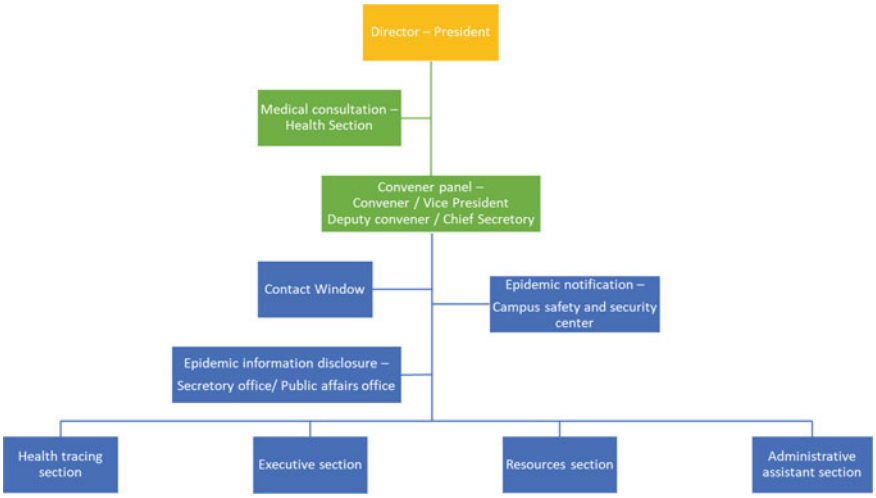


Fig. 11.2 Organization diagram of Epidemic Protection Team

and regulations. Symptomatic case records are retrieved from the epidemic information platform by members of the Contact window. The data will be presented to the Director, Convener, and vice Convener to let them know of the epidemic condition on the campus. Epidemic training course arrangements, consultation referencing, case tracing and visiting, and material preparation for the EPT meeting. Besides, the campus epidemic news will be released by the Epidemic information disclosure in order to fulfill the spokesperson system to clarify the epidemic situation in a consensus of the EPT.

The EPT also has four sections, Health tracing, Executive, Resources, and Administrative assistant section, governed by the Director and Convener panel to perform the COVID-19 affairs. The responsibilities of each section can be elucidated as below.

Health tracing section—The Health Center can conduct this section. In the preparedness phase, the Health tracing section should construct case tracing and emergency transportation plans.

Executive section—The plans of international student's exit and entry monitoring and management, flexible learning scheme, high-risk potential student accommodation, management of incoming students from an infected area, cluster infection and safety controls, and anti-pandemic implementations.

Resources section—Containing preparedness aspects of diet supply, campus restaurant management, epidemic information platform construction, personal protection equipment (PPE) purchase, case caring and delivering, sterilization plan to support the anti-pandemic work on the campuses.

Administrative assistant section—Including the Accounting and statistics office and Personnel office to facilitate the administrative processes for performing the EPT actions.

It is worth mentioning that the teachers should take the training courses to familiarize the operation of online teaching software, such as Zoom Rooms, Microsoft Teams, and Eclass (TronClass; scholastic software of YunTech).

11.2.3 Response

In the response phase, the confirmed and suspected active cases (body temperature $\geq$ 38 °C, contact history of confirmed cases, and travel history of the infected area) will be monitored and managed strictly based on the plans mentioned above in the preparedness phases. In the case of YunTech, every day, all members on the campus should do their health self-examinations, and the results must upload onto the epidemic information platform. Moreover, all buildings only leave one entrance to inspect the body temperatures for the enterers and forbid the persons from not wearing masks to protect the safety of the residents therein. The buildings will be sterilized regularly using chemicals, and the classrooms shall keep ventilation during a course. After a vacation, the travel histories will be traced by the school. Once the highly infectious risk places have been arrived by the campus members, the EPT will ask them to self-quarantine at home or dormitory. Teachers should use a

flexible learning policy to perform distance teaching by sending the lesson records or employing online real-time teaching via video conference software when the students cannot attend the classes. All the standard operation protocols of the response actions can be found in the EPT resolution for each HEI.

11.3 Epidemic Information Platform and Artificial Intelligence Technology

In Taiwan, every HEI developed its own epidemic information platform not only to provide all kinds of COVID-19 pandemic details to the staff and students but also to collect the health conditions of all. It offers valuable and comprehensive information through the website, such as the announcements and regulations of the Taiwan Centers for Disease Control, COVID-19 latest news, anti-epidemic measures, the link of the notification system, questionnaires, distance teaching, relieved zone, contact information, etc. Nevertheless, information on the relieved zone is primarily for the freshmen and the students who are anxious and at a loss during the COVID-19 pandemic. They can find plenty of methods and resources to release the physical and psychological pressures. Figure 11.3 shows the website map of the epidemic

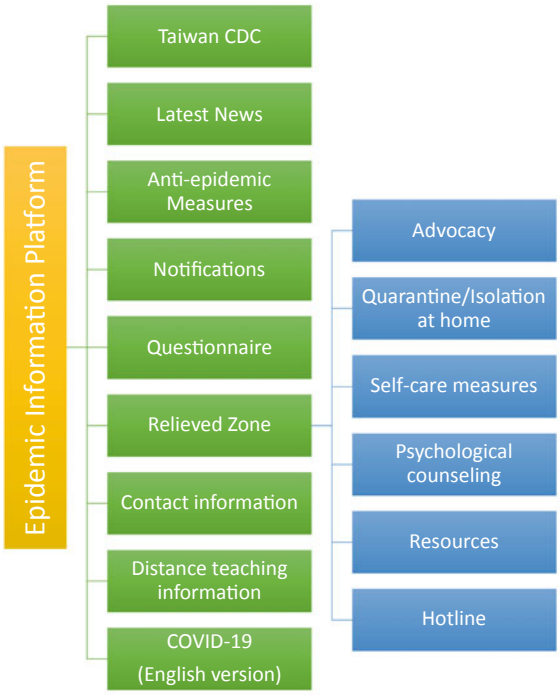


Fig. 11.3 The website map of the YunTech's epidemic information platform

information platform of YunTech as a reference (https://www.yuntech.edu.tw/index.php/coronavirus).

On the other hand, the platform will collect the health conditions through different ways, for instance, the QR codes scanning at the building entrances, the self-health notification system, the campus leave system, and the dedicated lines and websites. In YunTech, every building on the campus installs a machine with an automatic body temperature detector to screen the fever ones with a voice warning. After scanning the specified QR code, the data of the symptomatic cases will be collected and notified by the epidemic information platform. It goes without saying that the fever ones cannot enter the buildings and shall be responded to and followed up by the EPT protocols. The self-health notification system is frequently applied in long-term vacations such as the summer, winter vacation, etc. During vacations, the EPT will ask school members to fill out an electronic health questionnaire by logging into their school information system accounts. The platform will collect and analyze the responses from the questionnaires to notify EPT counterparts. Once the confirmed and suspected cases are screened, the EPT will follow up on the cases and provide the necessary help. In addition, the campus leave system and the dedicated lines, as well as websites, can be the other data resources of the confirmed and suspected cases for feeding the epidemic information platform.

AI technologies are extensively employed during the COVID-19 pandemic. Based on the previous study (Billy 2020; Naudé 2020; Vaishya et al. 2020; Wang et al. 2020), the AI can perform its vital capability to fight against the COVID-19 pandemic in at least six areas: early warnings and alerts, tracking and prediction, data dashboards, diagnosis and prognosis, treatments and cures, and social control. Although the central part of AI application focuses on tackling the pandemic, the basic core technologies, such as Machine Learning, Deep Learning, and Natural Language Processing, can be readily utilized in education applications during the epidemic period. The e-learning, distance education, learning management, and tutoring system are widely used for the above-mentioned issue. For example, image recognition techniques can promote communications between teachers and students through interactive whiteboards on e-learning platforms and distance education software. In addition, this AI technology can monitor and record the learning images of remote students to analyze their learning conditions. Machine learning and Big data analysis of AI technologies are beneficial to online active learning and tutoring systems. The scoring and ranking processes, marking exams and homework, and evaluating peer learning achievements are accessible by the aforementioned techniques. The relative AI technologies which affect Taiwan's HEIs can be introduced in the following paragraphs.

11.3.1 Big Data Analytics

The MOE will collect epidemic notification data from all levels of schools, including the HEIs, to the correspondent central information sector. All data will be analyzed

and discussed in the meeting of the chief administrative officers, and the decisions and regulations will be reported by the official single channel of the CECC. Nevertheless, some specific issues of education, such as delay of the start of school, can be announced by the MOE in concert with the policies and regulations of the CECC.

Every day, the COVID-19 dashboard is renewed, and the CECC announces the anti-epidemic policies and measures to make the people in Taiwan understand the latest epidemic situation. This information will affect the activity and practice against the pandemic in the HEIs. For instance, the border control policy caused international students to not return to schools before their opening. Therefore, the HEIs should prepare the distance learning measures to overcome the study barriers due to the COVID-19 pandemic. Other than that, the CECC will predict and inspect the hotspots of the crowded areas with highly cluster infectious potential before and during vacations. Once the HEI members have been to the CECC listed hotspots after their vacation, they should take a 14-day self-health monitoring quarantine. During this time, the HEIs should provide flexible learning methods to the students, such as making up the missed classes, online learning, distance education, etc.

11.3.2 E-learning Platform

In Taiwan, different HEIs have different e-learning platforms. Using YunTech as an example, the Eclass (TronClass) learning platform has been adopted for this purpose. Although the Eclass (TronClass) platform was established before the COVID-19 pandemic, this e-learning platform thrived over there after the COVID-19 outbreak. According to the data provided by Yuntech's Personnel Office, as of 13 August 2020, there are 340 teachers and 9808 students in YunTech. However, the Eclass (TronClass) platform has 13,931,125 visits as of 18 March 2021. The number of visits and visitors on the Eclass (TronClass) platform between 12 and 18 March 2021 can be depicted in Fig. 11.4. Eclass platform containing multiple functions to adapt to learn during the pandemic. The platform comprised 16,552 classes, including 75 open courses. Teachers can take the class digital videos and prepare the electronic learning materials to upload to the Eclass (TronClass) platform, while the students can study online or download the lesson materials for offline reading. The platform can be logged-in during class time so that online students can participate in real-time course activities, such as online voting, exercise practicing, homework submitting, testing, etc. The platform can record the study history of the students and the revisions and scores from teachers. The vital shortcoming of the Eclass (TronClass) platform is that it cannot perform audio–video learning and teaching in a real-time manner, so the commercial software of Microsoft Teams and Zoom Rooms are popularly applied in Taiwan's HEIs for distance education.

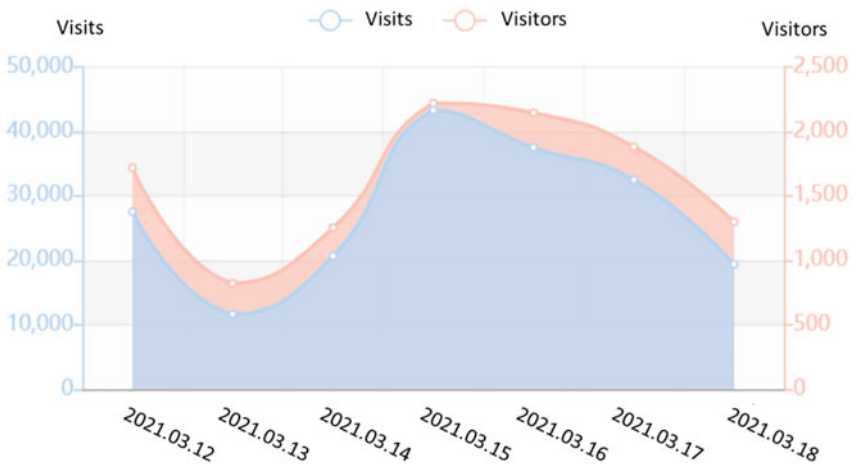


Fig. 11.4 Number of visits and visitors on the YunTech Eclass (TronClass) platform (2021.03.12–2021.03.18; adapted from YunTech Eclass [TronClass] platform with permission)

11.3.3 Distance Education

During the COVID-19 pandemic, in order to keep the continuous learning of the students who are unable to attend the classes, especially the international students, the HEIs adopted the distance education policy by employing video conferencing software for learning in different places. For this purpose, there are many software packages, such as Zoom Rooms, CyberLink U Meeting, Microsoft Teams, Cisco WebEx, Adobe Connect, Google Hangouts Meet, and Jitsi Meet. In Taiwan, the MOE suggested the Zoom Rooms for distance education initially and gave many supports to the program, for example, providing workshops and training courses for the teachers, uploading the Zoom Rooms kits on the Cloud server for free retrieving, promoting the numbers of the user accounts for that the teacher and students can join the video meeting at the same time, and so on. The Zoom Rooms was widely used in Taiwan's HEIs at the prophase of the COVID-19 pandemic. Unfortunately, due to information security concerns, the MOE banned the Zoom Rooms exertion on campuses on 7 April 2020. Arguments and questions were flooding not only on campuses but also in society. Nevertheless, the MOE kept the order forthrightly for the data breach issues. Therefore, the HEIs should change the software for distance education. YunTech has selected Microsoft Teams, and it is the primary software that has been constantly used so far.

11.3.4 "Auto"—A Multi-Functional Inspection Stand

In YunTech, teachers and students should take body temperature, spray alcohol, and log-in on the campus system by scanning QR codes when entering each building after a new semester starts. It will require a lot of workforce and time to accomplish the procedures. In order to improve the condition as mentioned above, YunTech's teachers and students of the Department of Electronics have organized the industrious invention to develop the first semi-automatic anti-epidemic inspection stand, "Auto," in Taiwan and set it up at the main entrance of all the buildings in the campus.

The industry participator supports medical-grade non-contact infrared forehead thermometers (Bluetooth models) and the link-up apps for the system. The modified processes include sensing school ID cards, measuring forehead temperature, and automatic alcohol spraying all in the "Auto" inspection stand. This collected information will be entered into the school epidemic information system to interpret the data using AI technology. Once the abnormal signals are read, the follow-up action will be implemented by the EPT. After estimating the new invention of "Auto," it is concluded that it saves time and manpower and makes the inspections more efficient. The R & D teams of the "Auto" stand are shown in Fig. 11.5, and the operation procedures of "Auto" are depicted in Figs. 11.6, 11.7, and 11.8.

Fig. 11.5 The R & D teams of the "Auto" inspection stand (YunTech Open News; adapted from: https://www.yuntech.edu.tw/index.php/2019-04-10-08-06-20/2019-04-10-08-06-21/2019-04-10-08-06-45/item/3058-auto)

Fig. 11.6 Sensing the school ID card by the "Auto" inspection stand (Photographed by author)

11.3.5 Others

11.3.5.1 Wearing Masks

Although AI applications for learning are commonly highlighted in HEIs, the face-to-face teaching and learning pattern is the regular class model in Taiwan's HEIs. Maintaining the class learning from the threats of the COVID-19 pandemic is challenging the educational decision-makers. In order to keep the original style of class learning, the members in a classroom should take strict self-protection measures. Wearing surgical masks is an essential requirement for teachers and students. How to satisfy the needs of surgical masks is another AI-related issue for influencing education sustainability. It is worth mentioning the successful surgical mask distribution policy in Taiwan.

There are many different opinions and arguments from the health authorities on utilizing facial masks in public and community settings (Feng et al. 2020). The WHO has updated its guidance to advise decision-makers on the use of masks for the general public. In order to restrain COVID-19 community transmission effectively and comprehensively, governments should encourage the general public to wear

Fig. 11.7 Taking forehead temperature by the "Auto" inspection stand (Photographed by author)

masks in specific situations and settings (WHO 2020a, b). Evidence suggested that COVID-19 could be transmitted in an asymptomatic phase, so wearing a mask can reduce the risk of community infections. In Taiwan, based on the SARS traumatic experiences in 2003 and mask-wearing cultures (Cheng, Cheng, et al. 2020; Ching-Fu et al. 2020), wearing the facial masks of the general public has become ubiquitous during the COVID-19 pandemic. Therefore, the government was increasing levels of surgical mask productivity and planning adequate dispensing policies.

One of the vital duties of the government health sectors is to offer appropriate surgical masks at a reasonable price to the inhabitants. During the COVID-19 pandemic, especially in the early stages, price gouging of surgical masks, disinfectants, and personal protective apparatuses caused panic nationally (Ivery and Kochkodin 2020). Taiwan's government was brainstorming to provide adequate surgical masks to curb inflated prices. Besides, a reasonable distribution of surgical masks is another linchpin to ensure that most people, including HEIs, gain primary protection against droplet infection. Once only a minor population of HEI members held masks, the purpose of comprehensive protection cannot be achieved due to a low shield ratio on a public health aspect. Therefore, mask dispensing methodology may be a turning point of success or failure in anti-epidemic combat.

Fig. 11.8 Automatic spraying of alcohol by the "Auto" inspection stand (Photographed by author)

11.3.5.2 Community Pharmacists

In Taiwan, to satisfy the needs of surgical masks for the mass public, the selling methods were changed several times and finally adopted the name-based rationing method. The community pharmacists fully support this policy in Taiwan to balance the supply and demand of surgical masks. However, there are challenges and opportunities for community pharmacists to implement the surgical mask dispensing policy. The general public can buy a specified number of masks in community pharmacies by a National Health Insurance Card (NHIC) registration within an allowable period. Over 99.9% of residents in Taiwan, including foreigners, have their NHICs (Executive Yuan 2021). Once the community pharmacist has written the NHIC, the medical information server of the National Health Insurance Administration (NHIA) will record the data in which the NHIC owner has bought the surgical masks. At the same time, his card cannot be re-recorded on a specified day to avoid the condition of a double claim. Therefore, large stockpiles by individuals can be diminished, and the vulnerable populations can get a sufficient number of surgical masks without any monopolization.

There are 6488 NHIA-contacted community pharmacies in Taiwan, and the density is about one community pharmacy per five square-kilometer; nevertheless,

the community pharmacies will flock to the big cities. Therefore, community pharmacists can organize a well-connected health and medical information network. Due to the accessibility of community pharmacies, the community pharmacists are competent to execute the mask dispensing policy. Over 96.86% of the NHIA-contacted community pharmacies joined the program (MOHW 2020). The community pharmacists were standing in a dilemma that they would spend their working hours and extra efforts to voluntarily serve the customers in a long line for buying the surgical masks. Besides, they will have an extra high exposure risk by contacting the crowd. Nevertheless, an extra high percentage of the community pharmacists show their professional duties and social responsibilities to overcome the personal factors to endorse the name-based mask dispensing policy. They think that a pharmacist's professionalism keeps the public away from illness and suffering via their efforts. Subsequently, the community pharmacists earned huge social admiration and respect, and even Taiwan's President thanked community pharmacists in public.

In order to dispense the surgical masks efficiently and conveniently, the community pharmacists spent much time packing specified pieces of surgical masks into an envelope. However, it can save the dispensing time and maintain the quality of surgical masks by examining them in detail via the packing process. A report showed that the community pharmacists' workload was increased by about fivefold during the COVID-19 outbreak (Wu 2020). They put significant effort into implementing a name-based rationing policy for dispensing surgical masks.

In Taiwan, most community pharmacies are managed by one pharmacist and only have one computer for connecting with the NHIA server. The procedure for buying a specified number of surgical masks should take a couple of minutes to hours to wait. Nagging, complaining, and scolding can be observed in the crowded waiting group. Nonetheless, community pharmacists still use their best endeavor to stand with the citizens against the pandemic. The community pharmacists' great compassion inspired the pharmacy students in HEIs to practice in the community pharmacies and to assist the senior pharmacists to face the COVID-19 difficulties together. Moreover, the surgical mask dispensing work is only a primer for the community pharmacists since they can get more connections to the public to educate them, such as the correct way of social distancing, handwashing, mask-wearing, household cleaning, and information updating.

Although dispensing masks was one of the epidemic mitigation measures, the facts indicated that this action shows the effectiveness of alleviating public, community, and campus infections. In this AI application case, we learn that anti-epidemic action is teamwork that cannot be separated absolutely. Once HEI members cannot obtain adequate PPEs, such as surgical masks, the cluster infections should be predictable, and the subsequent school closure would go without saying.

11.4 Practical Actions in HEIs

The practical actions in Taiwan's HEIs are mainly complied with the directions, orders, and regulations of the MOE and CECC and are directly guided by the campus EPTs. The practical actions in different Taiwan's HEIs may only have a slight difference; therefore, we choose the YunTech as a case study to illustrate the actual scenario of the essential practical anti-epidemic measures in the campus.

11.4.1 Workshops and Training Courses

Taiwan's HEIs will provide many anti-epidemic and training courses for the teachers and teacher assistants (TAs). To prevent cluster infections, almost all courses had been changed to online learning styles. Teachers should have the ability to provide a distance learning course to the students via software, such as Microsoft Teams. They should also be familiar with the operation of the e-learning platform, such as Eclass (TronClass). All these preparations have been done in advance to avoid disconnection of learning due to the school closure. The COVID-19 pandemic gives an "e-class" to the HEI teachers and students, no matter if you like it or not.

11.4.2 Wearing Surgical Masks in Classrooms and Other Indoor Spaces

In classrooms and other indoor spaces, all the teachers and students are asked to wear surgical masks to prevent droplet infections. The surgical mask cover rate is 100% since the one without wearing a surgical mask will not be allowed to enter the classrooms and other indoor spaces. The used surgical masks should be replaced after one or two days, so the consumption of surgical masks is very high during the COVID-19 pandemic. Therefore, the resupply system of surgical masks should satisfy the needs of the HEI members to continue education on campuses. That is why the name-based rationing distribution policy of surgical masks is the linchpin for sustainable education in schools.

11.4.3 Roll Call and Name-Based Registrations

To facilitate the active and contact case tracing, teachers should do a roll call for every class to ensure the class attendee and to care for the health conditions of the students. Besides, the students should put signatures on a blank seating plan (sample can see Fig. 11.9) to confirm the geographical relationships with the nearby members, while

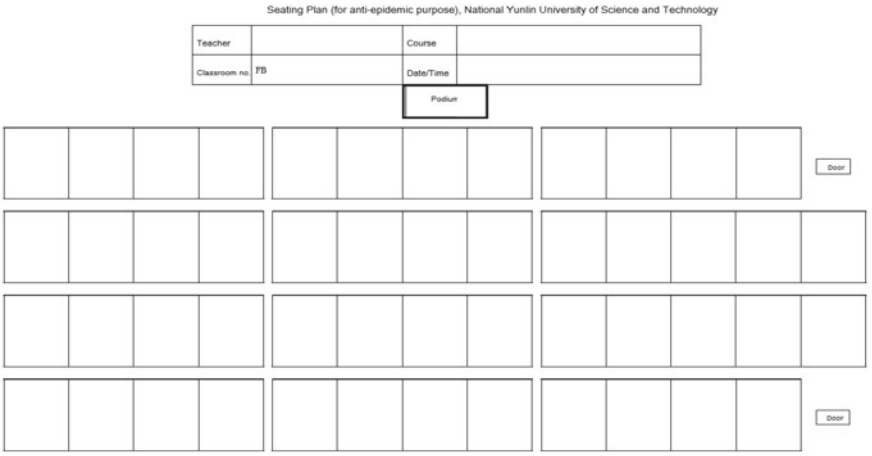


Fig. 11.9 A seating plan for students in YunTech (The FB 204 classroom at College of Future as a sample; provided by author)

in a large lecture hall, teachers or TAs should take the pictures in different directions to image all to record their seat positions. The purpose of the measures is that once the teachers and students have been confirmed as active cases, the EPTs can easily trace the high-risk population sitting near the infected carriers to do further SARS-CoV-2 screening examinations.

11.4.4 Health Inspection at the Building Entrance

During the COVID-19 pandemic, all buildings in YunTech only leave one entrance to monitor the health conditions of the entrants. The "Auto" inspection stands can detect body temperatures. Once no fever is read, the entrants can scan the asymptomatic QR code and download the good health icon in the cell phone as a passport for entering the other buildings in a day. This innovation can prevent redundant inspections at different building entrances and increase the passing efficiency. The QR code samples are shown in Fig. 11.10 and the health icon sample in Fig. 11.11.

11.5 Conclusions

In Taiwan, with a population of around 24 million people, according to the updated report of COVID-19 status, there are 1004 confirmed cases and 10 deaths on 19 March 2021, while the mortality rate is about 1.00%. The achievements against the COVID-19 pandemic have currently aroused researchers and mass media's attention to discuss

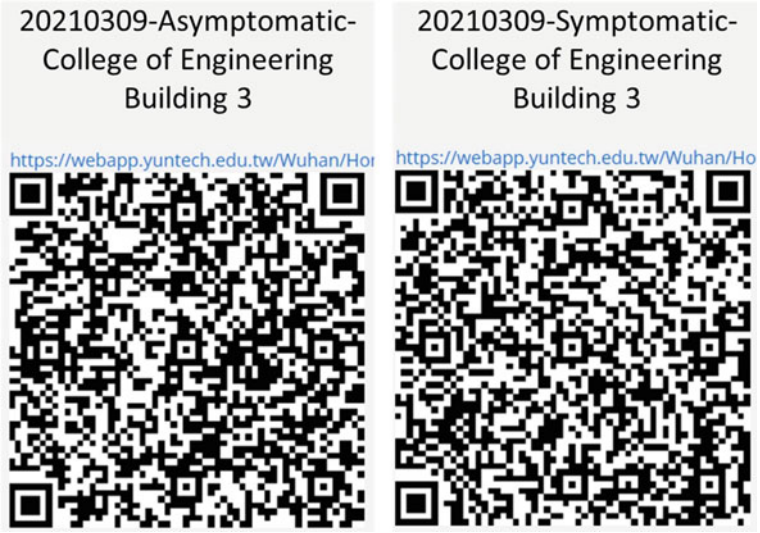


Fig. 11.10 The QR code samples for the different health conditions (The pictures were taken by author on 9 March 2021 in Building 3, College of Engineering, YunTech)

Fig. 11.11 Sample of the health icon as a passport for the building entrance in YunTech (Sample icon was provided by author)

the acceptable response measures due to the less confirmed cases and mortality in Taiwan. Since the pandemic is relatively minor compared to other countries, no HEI has been forced to close. The success comes from the cooperation between the government and the HEI members. Although the MOE and CECC issued plenty of directions, orders, and regulations, the HEI members followed the rules without irreconcilable conflict. The fruitfulness results from anti-epidemic perseverance and patience.

In this chapter, we emphasize the importance of disaster management for systemic fighting the COVID-19 pandemic. The organized command system, such as EPTs,

can coordinate with HEI forces to combat the pandemic. The epidemic information platform and AI technology have been well discussed in recent educational publications. They can boost the idea of "the classes suspended but learning continues" becoming true. Distance education is prevalent at present throughout the world due to the COVID-19 impact. Name-based rationing of surgical mask distribution is a successful policy for satisfying the primary PPE needs. It may be a vital reason to keep the school open during the epidemic hard time. The concrete actions are analyzed in YunTech campus as a reference to discover the existing scenario in Taiwan's HEIs.

Some problems were encountered in HEIs during processing the COVID-19 pandemic: (1) Most HEI members have come of age with a full behavioral capacity; therefore, some of them don't follow the anti-epidemic orders and indications, and even refuse some monitoring inspections. (2) Since the HEI students are the young population, it is not easy to contain their activities and get-togethers. (3) Due to travel limitations, the teachers cannot travel abroad to participate in international conferences in a face-to-face profound discussion manner. (4) Although distance education provides a convenient way for teaching and learning during the school closure, teachers never know what happens beyond the students' screens. (5) Once taking a formal examination on Internet, we do not have well-established invigilation systems to prevent cheating matters. (6) Courses required to attend in person will be inadequate for distance education. (7) Some important ceremonies such as graduation cannot be held on campus; moreover, the oral defenses of theses, as well as dissertations, cannot be taken place in schools for public hearings. Although these problems were not completely overcome during the COVID-19 pandemic, we believe that new technologies and innovations will improve these issues in future. However, the COVID-19 pandemic gives HEIs a difficult lesson to learn. In Taiwan, the HEI members do their utmost to stand in their positions to fight together. It may be the best experience learned from the COVID-19 pandemic.

References

Baum T, Hai NTT (2020) Hospitality, tourism, human rights and the impact of COVID-19. Int J Contemp Hospitality Manage

Billy M (2020) The influence of dynamic organizations and the application of digital innovations to educational institutions in the world during the COVID-19 pandemic. Available at SSRN 3588233

Cheng K, Cheng V, Zou C (2020) Urgent prevention of Corona virus disease 2019 (covid-19): Chinese eating and mask-wearing cultures. J Public Health Int 2(2):8

Cheng S-Y, Wang CJ, Shen AC-T, Chang S-C (2020) How to safely reopen colleges and universities during COVID-19: experiences from Taiwan. Ann Intern Med 173(8):638–641

Ching-Fu L, Chien-Huei W, Chuan-Feng W (2020) Reimagining the administrative state in times of global health crisis: an anatomy of Taiwan's regulatory actions in response to the COVID-19 pandemic. Eur J Risk Regul:1–17

De Giusti A (2020) Policy brief: Education during COVID-19 and beyond. Revista Iberoamericana de Tecnología En Educación y Educación En Tecnología (26):e12–e12

Feng S, Shen C, Xia N, Song W, Fan M, Cowling BJ (2020) Rational use of face masks in the COVID-19 pandemic. Lancet Respir Med 8(5):434–436

Guan D, Wang D, Hallegatte S, Davis SJ, Huo J, Li S, Bai Y, Lei T, Xue Q, Coffman DM (2020) Global supply-chain effects of COVID-19 control measures. Nat Hum Behav:1–11

Ivery B, Kochkodin B (2020) For New York, 58-cent medical masks now priced at $7.50 Each. Retrieved March 20, 2021, from https://www.bloomberg.com/news/articles/2020-03-24/for-new-york-58-cent-medical-masks-now-priced-at-7-50-each

McKibbin W, Fernando R (2020) The economic impact of COVID-19. Economics in the Time of COVID-19:45

MOHW (2020) Part of the NHIA-cantacted pharmacies don't sell surgical masks, please call us. Retrieved March 20, 2021, from https://dep.mohw.gov.tw/dos/cp-3899-51535-113.html

Naudé W (2020) Artificial intelligence against COVID-19: an early review. *IZA DP* 13110

Pragholapati A (2020) COVID-19 impact on students

Vaishya R, Javaid M, Khan IH, Haleem A (2020) Artificial intelligence (AI) applications for COVID-19 pandemic. Diabetes Metab Syndr 14(4):337–339

Wang CJ, Ng CY, Brook RH (2020) Response to COVID-19 in Taiwan: big data analytics, new technology, and proactive testing. JAMA 323(14):1341–1342

WHO (2020a) COVID-19: face mask and hygiene advice. Retrieved March 13, 2021, from https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-novel-coronavirus-health-advice-general-public/covid-19-face-mask-and-hygiene-advice

WHO (2020b) Rational use of personal protective equipment (PPE) for coronavirus disease (COVID-19): interim guidance, 19 March 2020. World Health Organization, Geneva

Wu Z-Y (2020) After lifting the rationing policy—the public still like the government-offered surgical masks in community pharmacies. *United Daily News*. Taiwan

Yuan E (2021) Introduction to national health insurance. Retrieved March 20, 2021, from https://www.ey.gov.tw/state/A01F61B9E9A9758D/fa06e0d2-413f-401e-b694-20c2db86f404

Chapter 12
Applying New Technologies and Innovation in Hong Kong: Teaching Health Emergency and Disaster Risk Management (Health–EDRM) Using Massive Open Online Course to Enhance Resilience in Higher Educational Institutions

Emily Ying Yang Chan, Chi Shing Wong, Eugene S. K. Lo, and Zhe Huang

Abstract Massive Open Online Course (MOCC) is an emerging mode of higher education across the world. Amidst the COVID-19 pandemic and subsequent campus closure worldwide, its potential became more apparent. The Collaborating Centre for Oxford University and CUHK for Disaster and Medical Humanitarian Response (CCOUC) had been running the global web-based Health-EDRM course "Public Health Principles in Disaster and Medical Humanitarian Response" from 2014 to 2019 to build disaster resilience in a doubt sense: for its users as receivers of education service and for the higher educational institution as the provider. A total of 7,749 participants from more than 150 countries registered for the Health-EDRM online course, with an exceptionally high course completion rate of 23.21%. Drawing on the capacity and resilience built up by this preparedness activity, CCOUC was running another 10 global Health-EDRM MOOCs in English and two in Chinese during the COVID-19 pandemic, and at the same time collaborating with academic units and programmes at its parent The Chinese University of Hong Kong to offer these courses for fulfilling students' course requirements. Thousands of students across the world were benefited, particularly those in developing countries in Asia and Africa. This chapter will explore this successful higher education institution resilience building experience.

E. Y. Y. Chan (✉) · C. S. Wong · E. S. K. Lo · Z. Huang
JC School of Public Health and Primary Care, The Chinese University of Hong Kong, Hong Kong, China
e-mail: emily.chan@cuhk.edu.hk

E. Y. Y. Chan
GX Foundation, Hong Kong, China

T. Izumi et al. (eds.), *Safety and Resilience of Higher Educational Institutions*,
Disaster Risk Reduction,
https://doi.org/10.1007/978-981-19-1193-4_12

Keywords Health Emergency and Disaster Risk Management (Health-EDRM) · New technologies and innovation · Massive Open Online Course (MOOC) · COVID-19 · Resilience · Higher educational institutions

12.1 Introduction

When COVID-19 struck Hong Kong Special Administrative Region (SAR) of China in January 2020, The Chinese University of Hong Kong (CUHK) as a higher educational institution with emergence response plan in place swiftly kicked start its response according to the pre-existing plan, demonstrating a preparedness culture and a certain level of disaster resilience of a higher educational institution. More deeply and fundamentally, the experience of developing and running a Massive Open Online Course (MOCC) in Health Emergency and Disaster Risk Management (Health-EDRM) by the university's research unit at its Faculty of Medicine had laid a solid foundation of disaster resilience for this higher educational institution six years before the pandemic. This chapter will first describe the response employed by this higher educational institution during the first 14 months into the pandemic when the city had experienced four waves of outbreak. It will then look into the ground works laid by the development of a Health-EDRM MOOC, which paved the way for the further development of a dozen of Health-EDRM MOOCs to provide disaster resilience to this higher educational institution.

12.2 Response to COVID-19 as a Biological Hazard by Higher Educational Institutions: A Case in Hong Kong

Being the university of the largest student body among the eight publicly funded universities in Hong Kong, CUHK is among the two comprehensive research universities in this cosmopolitan city that have a faculty of medicine (University Grants Committee 2020). It had 17,606 undergraduate and 3,799 postgraduate students on the eve of the pandemic at the end of 2019, among whom 2,474 (14.05%) and 2,177 (57.30%) were non-local (CUHK 2020, p. 24).

The university's response to COVID-19 was coordinated by its well-established high level Committee on Health Promotion and Protection (CHPP) chaired by a Pro-Vice-Chancellor, which has maintained a 5-level CUHK Preparedness Plan for Influenza Pandemic / Major Infection since December 2012 based on the 3-level Preparedness Plan for Influenza Pandemic of the Hong Kong SAR Government. The plan described the measures to be taken by various units on campus at different stages of an outbreak, making speedy response in emergency possible (CUHK Committee on Health Promotion and Protection n.d.b) (See Table 12.1).

Table 12.1 5-level CUHK preparedness plan for influenza pandemic / major infection

Response level		Description
1	**General Preparedness and Vigilance**	Maintain preventive measures, personal hygiene habit, environmental hygiene, and vigilance for prevention of large-scale outbreaks
2	**Alert Response Level**	The risk of a novel pathogen causing new and serious health impact in Hong Kong is **low**
3	**Serious Response Level**	The risk of a novel pathogen causing new and serious impact to human health in Hong Kong is **moderate**
4	**Emergency Response Level**	The risk of a novel pathogen causing new and serious impact to human health in Hong Kong is **high and imminent**
5	**Urgent Response Level**	There is confirmation of novel outbreaks on campus. Evidence shows that the pathogen can cause serious illness and pose a significant impact on the health of students and staff

The Chairman of the CHPP first announced on 6 January 2020 that the Hong Kong SAR Government has launched the Preparedness and Response Plan for Novel Infectious Disease of Public Health Significance and activated the Serious Response Level due to the cluster of viral pneumonia cases with unknown cause in Wuhan of China, and that the University Health Service (UHS) would closely monitor the health surveillance on campus. Health advices including hand hygiene, sneezing and coughing etiquette, and wearing surgical mask when having respiratory symptoms were issued. On 23 January, upon two cases of positive results for novel coronavirus in the city and the government's Centre for Health Protection enhancing surveillance of suspected cases and revising the reporting criteria of severe respiratory disease associated with a novel infectious agent, the CHPP announced that the UHS would follow the revised reporting criteria and closely monitor the health surveillance on campus. Cleaning was stepped up throughout the campus. Staff and students were required to fill in a health declaration form after travelling abroad and monitor their health status using the self-medical surveillance form for 14 days. The next day, CUHK announced cancellation of exchange programmes and suspension of short-term academic activities in the mainland of China. On 25 January, the university activated the Emergency Response Level on campus following the government's elevating the response level to Emergency, requiring all university members to wear a surgical mask and encouraging local students residing in university hostels to return home. The Lunar New Year holiday was also extended to 16 February. From 29 January to 1 March, except for those staff providing essential services, all university staff were required to work-from-home. A higher level university Emergency Response Group was formed, led by the Vice-Chancellor and staffed by members of senior management and relevant heads of the professional and administrative services units. The group met regularly

and frequently to keep abreast of local and overseas developments and to deliberate on infection control and academic and work arrangements, informed and advised by the CHPP. (CUHK n.d.; CUHK Committee on Health Promotion and Protection n.d.a).

Online teaching by teachers from their home following the original timetable via ZOOM started on 17 February and last for the whole spring term until 2 May, with the term extended for two weeks to compensate for the extended Lunar New Year holiday. To prepare for online teaching, the University organized 22 online workshops from 30 January to 14 February to assist teachers, students, and supporting staff from all faculties to get familiar with the online teaching facilities. Laptop computers were available on loan for needy students and bandwidth of the university internet network was increased. The university library system introduced a new print-to-e-copy service by which staff and students could request an e-copy of an existing library print book if the e-copy was available. On the first two days of online teaching, 2,320 classes were conducted, with an average of about 90% attendance (CUHK n.d.).

On 5 March, the CHPP advised the university members to avoid unnecessary travel outside the city. On 23 March, the University revised one-site and work-from-home arrangements which were to be decided by respective unit heads. Only limited services were provided by academic departments and supporting units. The university's libraries were closed for two weeks from 30 March (CUHK n.d.; CUHK Committee on Health Promotion and Protection n.d.a).

From 4 May, normal operation of the university was gradually resumed. Some face-to-face teaching was resumed for the summer session, with the requirement of body temperature monitoring and mask wearing. However, upon a new wave of outbreak, work-from-home arrangement was adopted from 14 July to 23 August. All student orientation activities for the new academic year were conducted online (CUHK n.d.).

In August 2020, CUHK developed the Virtual Student Exchange (VSE) programme within the Association of Pacific Rim Universities (APRU), a network of 56 leading research universities from around the Pacific Rim. This programme enabled students to receive international education and experience without having to leave home. Utilizing digital technologies to adopt online learning and virtual interactions, the programme began its pilot semester with 14 participating APRU member universities from nine economies offering 78 online courses, and more than 400 applications were received with some 200 students being accepted and enrolled (CUHK Communications and Public Relations Office 2020).

After an initial online teaching in the fall term, a hybrid mode of online and in-person teaching was adopted by the university in October 2020, in view of the need for physical distancing. The university's congregation for the conferment of bachelor's and master's degrees was conducted online in November. Amidst the fourth wave of COVID infection, work-from-home or work-on-shift arrangements were resumed from 2 December 2020 to 17 February 2021 and most examinations for the fall term were conducted online. A hybrid mode of online and in-person teaching was maintained for the spring term (CUHK n.d.).

Innovative teaching and learning, as well as university administration, supported by new information and communication technologies was the key to CUHK's response to COVID-19 as a biological hazard and emergency. In addition to response, or rather as a basis of effective response, enhancing resilience may be even more fundamental for higher educational institutions to mitigate the risk created by prolonged biological hazard like COVID-19. At CUHK, the Collaborating Centre for Oxford University and CUHK for Disaster and Medical Humanitarian Response (CCOUC) of the Faculty of Medicine had been running a global Massive Open Online Course (MOCC) on Health-EDRM (Health Emergency and Disaster Risk Management) entitled "Public Health Principles in Disaster and Medical Humanitarian Response" from 2014 to 2019 to build disaster resilience for its two parent higher education institutions and beyond in a double sense: for its users as receivers of education service and for the higher educational institutions as education service providers.

12.3 Teaching Health–EDRM using MOOC for Disaster Resilience

12.3.1 Health Emergency and Disaster Risk Management (Health-EDRM)

The conceptual framework of Health Emergency and Disaster Risk Management (Health-EDRM) is a response to the challenge of the health impact of emergencies and disasters by putting people's health at the centre of emergency and disaster risk management (Chan and Shaw 2020; WHO 2019). It echoes the strong emphasis in the Sendai Framework for Disaster Risk Reduction on the need to integrate disaster risk management into healthcare provision at all levels and "to enhance cooperation between health authorities and other relevant stakeholders to strengthen country capacity for disaster risk management for health" (UNDRR 2015; WHO 2019). In addition to the need to collaborate multi-sectorally, Health-EDRM emphasizes the centrality of prevention, preparedness, readiness, and resilience, together with the more traditional focuses of response and recovery (Chan and Shaw 2020). However, literature has reflected insufficient education in Health-EDRM (Chan et al. 2017; Muttarak and Lutz 2014).

12.3.2 Massive Open Online Course (MOCC) and Health-EDRM Education

Since the first MOOC was launched in 2008 (Mallon 2013), more and more courses of different subjects have been offered in MOOCs, particularly for higher education and professional training. The number of MOOCs increased from 11,400 to 13,500 between 2018 and 2019, with over 110 million students and more than 900 universities involved worldwide (Murray 2019; Shah 2019). There were research about learner motivation, retention, and motivation in MOOCs, as well as factors for course dropout and completion like social engagement, course length, course assessment type, and active course engagement (Barak et al. 2016; Bozkurt et al. 2016; Jordan 2015; Phan et al. 2016; Yang et al. 2013; Zhu et al. 2018). While online course has its own limitation like lacking social interaction, administrative or instructor issues in the course, motivation of learning and low completion rate (Atchley et al. 2013; Muilenburg and Berge 2005), online course could reduce the significant cost barrier created by traditional classroom, particularly in middle and low income countries (Pollack Ichou 2018).

While online teaching and learning has been suggested as a solution to overcome the challenge of education accessibility and the lack of quality teachers (Islam et al. 2019), its great potential in medical sciences and Health-EDRM education has also been widely discussed (Skiba 2013). Online courses offer opportunities for flexible Health-EDRM learning since students are not restricted to learn at fixed times and places. Students from countries without local Health-EDRM course can save cost of travel, living expenses, and tuition fee taking online courses as compared with studying on-site courses in other countries. Students may also benefit from exposure to peers from a wider range of cultural backgrounds. Flexibility offered by Health-EDRM MOOCs may be especially appealing to those working in disaster settings, often with irregular work schedules (Tam et al. 2018). In response to the urgent need for Health-EDRM knowledge, online course could be a very valuable tool overcoming the financial and physical hurdles.

12.3.3 A Health-EDRM MOOC by CCOUC

To fill the gap in Health-EDRM education needs, Collaborating Centre for Oxford University and CUHK for Disaster and Medical Humanitarian Response (CCOUC) launched a free online course “Public Health Principles in Disaster and Medical Humanitarian Response (PHPID)” on the Oxford University online learning platform in June 2014. With teaching materials accumulated from lessons learnt in the field, the PHPID MOOC aimed at allowing students to gain insight and theoretical understanding of public health issues related to disaster and medical humanitarian relief in the Asia–Pacific region. A total of 10 cohorts were offered from 16 June 2014 to 15 October 2019, with 7,749 registrants from more than 150 countries. Other

than Hong Kong as the home base with 1,580 registrants (20.4% of the total), the top 10 areas/countries in descending order in terms of student recruitment were: Nigeria (574 students, 7.4% of the total), Kenya (291, 3.8%), the United States (287, 3.7%), the Philippines (284, 3.7%), the United Kingdom (248, 3.2%), India (246, 3.2%), Uganda (234, 3.0%), Ethiopia (220, 2.8%), Pakistan (201, 2.6%), and China (182, 2.3%). At the end, 6,523 students had actually enrolled in the course. Target students of this online course included those who were studying or working in health, humanitarian, education, and public policy sectors, especially those living in places with high frequency of disasters. In order to reach the target population, various channels like international conferences, mass emails to academic and professional institutions, and international NGO websites had been used for course promotion.

Each cohort of the MOOC consisted of seven lessons and five quizzes, including four interim quizzes each with 10 multiple choice questions randomly selected from a question bank and one final quiz with 30 randomly selected multiple choice questions. Students were required to pass an interim quiz before they could progress to the subsequent lesson. A certificate of completion was issued after passing the final quiz. Exchange with fellow students was available through online forums, and support from tutors available via email. A total of 1,514 certificates of completion were awarded to students, excluding 38 repeated certificates obtained by students completing more than one cohort. The completion rate is 23.21% (1,514/6,523), well higher than the usual single digit figures for MOOCs.

Students were recommended to spend one to three hours on studying each lesson. Every cohort had a minimum of five months' recruitment period. An additional month was allowed for registered students to complete the course after enrolment closure. Demographic information of the students was collected during online self-registration, which included age, gender, education level, mother tongue, highest academic qualification, occupation, working experience, current countries of residence, nationality, humanitarian experience, whether they were active in the humanitarian field in the previous year, reason for studying this course, and the first promotion channel from which they learnt about the course (Tam et al. 2018).

As intended learning outcomes of the MOOC, upon completing the course, students are expected to understand and discuss public health needs and gaps in disaster preparedness and response, specifically in the context of the Asia–Pacific region; systematically formulate key guiding questions during pre- and post-disaster phases to drive evidence-based disaster mitigation actions; and select and consult relevant and credible databases, guidelines, and documents to address the above issues (Tam et al. 2018).

Course materials supported these intended learning outcomes by providing accessible online text-based reading materials and multimedia materials. On top of main reading materials, there were optional "A-Closer-Look" text boxes to give additional information. A glossary and a "Take-home Message" were provided at the end of each section. Students were also directed to watch relevant videos via hyperlinks. Clear learning objectives were provided in the beginning of the course and each lesson. "Stop-and-Think" activities posing questions with answers behind a reveal button and polls for students to vote on a question and compare opinions

were employed to promote active learning. The bulk of course material was text-based to ensure accessibility and connectivity to those lack of high-speed internet, particularly in developing countries in need of Health-EDRM education, which may explain the exceptional high completion rate. Previous studies found that only half of the students and certificate earners watched the majority of course videos in MOOCs, which might be attributable to poor internet connectivity (Seaton et al. 2013, 2014; Zahn et al. 2014). The inclusion of online video conferences or live tutorial discussions could also make Health-EDRM MOOCs less flexible and attractive due to the higher threshold of required technology, extra study time commitment, and difference in student time zones.

Participants in the PHPID MOOC has also contributed to building a global community of Health-EDRM and thereby enhance disaster resilience. For example, the organizer of the online course immediately contacted students in Nepal after the two strong earthquakes in the country in 2015 to offer assistance, which kick-started a collaborating Health-EDRM education project in Nepal. Building a global community network and global disaster resilience is one of the most important benefits of using MOOC since students from different countries can foster cross-cultural exchange and connection. The eLearning platform crosses international boundaries and can complement existing teaching in face-to-face traditional classroom.

Based on this early experience of Health-EDRM resilience building for its learners, CCOUC developed another 10 free text-based Health-EDRM online courses in English of similar format and two video-based MOOCs in Chinese during the subsequent years (see Table 12.2), which were all ready for enrolment and study when COVID-19 struck in early 2020 to provide resilience for the higher educational institution to maintain a certain level of Health-EDRM education (CCOUC n.d.). The English MOOCs were hosted on the online platform of the Hong Kong Jockey Club Disaster Preparedness and Response Institute (HKJCDPRI) at Hong Kong Academy of Medicine (HKAM), while the video-based Chinese MOOCs were hosted on the XuetangX platform in the mainland of China to allow faster internet connectivity. Established in 2013, XuetangX was a leading online learning platform in Chinese language led by Tsinghua University, Beijing Normal University, Peking University, and Massachusetts Institute of Technology (MIT). In 2020, it had the largest number of online courses and users in China and hosted courses from leading universities in China, as well as from renowned international higher educational institutions like MIT, Stanford University, and University of California, Berkeley (XuetangX n.d.).

Upon registration, students were allowed to study the MOOCs at a safe location and at their own pace when circumstances allowed. A certificate of completion would be issued for students who had successfully completed each course. These courses helped students and practitioners to explore Health-EDRM issues during the challenging time of global public health emergency. CCOUC was also collaborating with academic units and programmes in the university to offer these courses for fulfilling students' course requirements, which reflected the successful building of institutional disaster resilience for the higher educational institution (CCOUC n.d.).

Table 12.2 CCOUC Health-EDRM MOOCs running during COVID-19 pandemic (CCOUC n.d.)

Language	MOOC
English	Climate Change and Health
	Research Methodology for Disaster and Medical Humanitarian Response
	Global Health Challenge for Human Security
	Core Public Health Concepts for Health Emergency and Disaster Risk Management
	Health System Approach in Managing Disaster
	Principles of Occupational Health and Challenges of Industrial Disasters
	Foundations of Food Security
	International Humanitarian Law
	Basic Sign Language for First Responders and the Public in Health Emergencies and Disasters
	Crisis and Risk Communication in Emergencies and Disasters
Chinese	Humanitarian Charter and Minimum Standards in Humanitarian Response
	Health and Disaster Preparedness in Rural China

12.4 Conclusion

In addition to highlighting the key role of an emergence plan of a higher educational institution in building its disaster resilience and thereby its emergency response to biological hazards, this case study highlighted the utility of MOOC in Health-EDRM education by demonstrating the feasibility and advantages of interdisciplinary and cross-border approaches in teaching Health-EDRM using MOOCs, which is another important means of disaster resilience building in a higher educational institution. This study illustrated that the MOOC format was effective in using technology to deliver a flexible, accessible and cost-effective Health-EDRM course and assessment, and to enhance student communication, support, and learning. In particularly, it prepared for and enhanced resilience in a prolonged biological hazard when physical distancing measures were implemented. A MOOC course could also reinforce resilience by contributing to building up a global health learning and practice community through the connection established between the instructors and students from around the world.

References

Atchley W, Wingenbach G, Akers, C (2013) Comparison of course completion and student performance through online and traditional courses. Int Rev Res Open Distrib Learn 14(4). https://doi.org/10.19173/irrodl.v14i4.1461

Barak M, Watted A, Haick H (2016) Motivation to learn in massive open online courses: examining aspects of language and social engagement. Comput Educ 94:49–60

Bozkurt A, Ozdamar Keskin N, de Waard I (2016) Research trends in massive open online course (MOOC) theses and dissertations: surfing the Tsunami wave. Open Praxi 8(3)
Chan EYY, Guo C, Lee P, Liu S, Mark CKM (2017) Health emergency and disaster risk management (Health-EDRM) in remote ethnic minority areas of rural China: the case of a flood-prone village in Sichuan. Int J Disaster Risk Sci 8(2):156–163
Chan E, Shaw R (eds) (2020) Public health and disasters—health emergency and disaster risk management in Asia. Springer, Tokyo, Japan
Collaborating Centre for Oxford University and CUHK for Disaster and Medical Humanitarian Response (CCOUC) (n.d.) Online courses on disaster and medical humanitarian response. Available at http://ccouc.org/online-courses-on-disaster-and-medical-humanitarian-response
CUHK (n.d.) CUHK vs COVID-19: announcements & actions. Available at https://www.cuhk.edu.hk/english/whats-on/faces/antivirus-annc.html
CUHK (2020) CUHK: facts and figures 2020. CUHK, Hong Kong. Available at https://www.iso.cuhk.edu.hk/images/publication/facts-and-figures/2020/html5/english/24/
CUHK Committee on Health Promotion and Protection (n.d.a) Chairman's announcement. Available at http://www.cuhk.edu.hk/health_promote_protect/chairman_announcement.html
CUHK Committee on Health Promotion and Protection (n.d.b) CUHK preparedness plan for influenza pandemic / major infection. Available at http://www.cuhk.edu.hk/health_promote_protect/preparedness_plan.html
CUHK Communications and Public Relations Office (2020) CUHK launches APRU virtual student exchange international education unbounded. Available at https://www.cpr.cuhk.edu.hk/en/press/cuhk-launches-apru-virtual-student-exchange-international-education-unbounded/
Islam MF, Akter T, Knezevic R (2019) The role of MOOCs in achieving the sustainable development goal four. Limerick Institute of Technology, Ireland
Jordan K (2015) Massive open online course completion rates revisited: assessment, length and attrition. Int Rev Res Open Distrib Learn 16(3):341–358
Mallon M (2013) MOOCs. Public Serv Q 9(1):46–53
Muilenburg LY, Berge ZL (2005) Students barriers to online learning: a factor analytic study. Distance Educ 26(1):29–48
Murphy K, Munk PL (2013) Continuing medical education: MOOCs (Massive Open Online Courses) and their implications for Radiology learning. Can Assoc Radiol J.
Murray JA (2019) Massive open online courses: current and future trends in Biomedical sciences. Adv Exp Med Biol 1171:47–53
Muttarak R, Lutz W (2014) Is education a key to reducing vulnerability to natural disasters and hence unavoidable climate change? Ecol Soc 19(1)
Phan T, Mcneil SG, Robin BR (2016) Students' patterns of engagement and course performance in a massive open online course. Comput Educ 95:36–44
Pollack Ichou R (2018) Can MOOCs reduce global inequality in education? Aust Mark J 26(2). https://doi.org/10.1016/j.ausmj.2018.05.0072018
Seaton D, Nesterko S, Mullaney T, Reich J, Ho A, Chuang I (2014) Characterizing video use in the catalogue of MITx MOOCs. Paper presented at European MOOC Stakeholders Summit, 10–12 Feb 2014, Lausanne, Switzerland.
Seaton DT, Rodenius AJ, Coleman CA, Pritchard DE, Chuang I (2013) Analysis of video use in edX courses. Paper presented at MOOCshop, 9 July 2013, Memphis, Tennessee. Available at: https://pdfs.semanticscholar.org/e249/e7d5d30ededa4598f961614b6a095fe62136.pdf
Shah D (2019) By the numbers: MOOCs in 2019. [Internet]. Available at https://www.classcentral.com/report/mooc-stats-2019/
Skiba DJ (2013) MOOCs and the future of nursing. Nurs Educ Perspect 34(3):202–204
Tam G, Chan EYY, Liu S (2018) A web-based course on public health principles in disaster and medical humanitarian response: survey among students and faculty. JMIR Med Educ 4(1):e2. Available at http://mededu.jmir.org/2018/1/e2/
United Nations Office for Disaster Risk Reduction (2015) Sendai framework for disaster risk reduction. Available at https://www.unisdr.org/we/coordinate/sendai-framework

University Grants Committee (2020) Student enrolment (Headcount) of UGC-funded programmes by university, level of study, mode of study and academic programme category, 2019/20. University Grants Committee, Hong Kong

World Health Organization (2019) Health emergency and disaster risk management framework. World Health Organization, Geneva, Switzerland

XuetangX (n.d.) XuetangX Homepage. Available at https://www.xuetangx.com/?channel=navigation_bar

Yang D, Sinha T, Adamson D, Rose CP (2013) "Turn on, tune in, drop out": anticipating student dropouts in massive open online courses. NIPS Workshop on Data Driven Education, Lake Tahoe, NV, USA, 9–10 Dec 2013. Available at https://www.cc.gatech.edu/~dyang888/docs/nips13.pdf

Zahn C, Krauskopf K, Kiener J, Hesse F (2014) Designing video for massive open online education: conceptual challenges from a learner-centered perspective. Paper presented at European MOOC Stakeholders Summit, 10–12 Feb 2014, Lausanne, Switzerland.

Zhu M, Sari A, Lee MM (2018) A systematic review of research methods and topics of the empirical MOOC literature (2014–2016). Internet Highe Educ 37

Chapter 13
Scope of Civil Society and University Partnership in Enhancing Resilience

Sangita Das and Takeshi Komino

Abstract The chapter highlights a multi-stakeholder effort to capture lessons from July 2020 flooding in Kumamoto, Japan. In pursuit of achieving the objectives of Sendai Framework for Disaster Risk Reduction, learning from each disaster event to enhance resilience is critical. Climate related risks are rising globally, and since early 2020, the world has also suffered from the COVID-19 pandemic. It is becoming a "new normal" to respond to multiple disasters at the same time, and the recent research effort highlights key lessons in evacuation, management of evacuation shelters, volunteer management, and early recovery. Kumamoto University, along with Kochi University, Keio University, and Tokyo University, played a key role in offering on-the-ground insights into the South Japan flooding of July 2020 amid COVID-19 pandemic.

Keywords Disaster · Risk · COVID-19 · Cascading · Lessons

13.1 Introduction

Globally, including Asia, average daily and seasonal temperatures are changing, and experts warn significant negatives consequences, especially for increased and prolonged drought if the trend is not curbed. These changes related to climate change include increases in rains and flooding, rising sea levels and saline (sea) water encroachment on farmland, and stronger and more frequent hurricanes and typhoons. IPCC's Special Report on the impacts of global warming of 1.5 °C highlights that "climate-related risks to health, livelihoods, food security, water supply, human security, and economic growth are projected to increase with global warming of 1.5 °C and increase further with 2 °C." The complexity comes with such interlinkage and cascading characteristics of the hazards, compounded with the complexity around the communities' exposure and vulnerabilities to hazards.

S. Das · T. Komino (✉)
Church World Service (CWS), Tokyo, Japan
e-mail: t.komino@cwsjapan.org

T. Izumi et al. (eds.), *Safety and Resilience of Higher Educational Institutions*,
Disaster Risk Reduction,
https://doi.org/10.1007/978-981-19-1193-4_13

The Sendai Framework for Disaster Risk Reduction (SFDRR) sets out four priorities for action; (i) Understanding disaster risk; (ii) Strengthening disaster risk governance to manage disaster risk; (iii) Investing in disaster reduction for resilience and (iv) Enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation, and reconstruction. Within the first priority for action, understanding disaster risk, the framework highlights that "policies and practices for disaster risk management should be based on an understanding of disaster risk in all its dimensions of vulnerability, capacity, exposure of persons and assets, hazard characteristics and the environment." In other words, unpacking the complexity of interaction and cascading characters of hazards with various social, economic, environmental, political, and security issues. For example, Adelphi's Climate Diplomacy initiative highlights cases studies such as poor water provision linking to further insecurity in Afghanistan, and how climate change affects the migration patterns which leads to the rise in tension on natural resources in Assam, India.

At the same time, it is not entirely about finding these linkages and cascading characteristic of risk, but the action to practically mitigate the risk level is required, and as SFDRR highlights, "disaster risk reduction practices need to be multi-hazard and multi-sectoral, inclusive and accessible in order to be efficient and effective." NGOs tend to work directly with affected communities, but may not be familiar with scientific analysis of unpacking the complexity of risk drivers and their inter-relationships. Researchers, on the other hand, may unpack such complexity and understand the science behind it, but may not have the means to put them in practice. That is why for organization such as CWS Japan, collaboration between NGOs and academia is crucial.

However, such multi-sectoral collaboration does not happen automatically, and it is common for both sides having the difficulty in figuring out where to start the collaboration. True collaboration requires a shared vision, based on the principles of partnership such as the one set out by International Council of Voluntary Agencies (Equality, Transparency, Results-Oriented Approach, Responsibility, and Complementarity), but this requires some sort of a common ground to start practical collaboration. CWS Japan believes that every disaster provides an insight into the complexity of risk drivers and their inter-relationships, and it proactively collaborates with academic institutions to review each disaster to capture key lessons learnt for further enhancement of disaster risk reduction practices. This chapter highlights a specific case of multi-stakeholder effort to capture lessons from July 2020 flooding in Kumamoto, Japan, and it aims to showcase how civil society and universities can collaborate in enhancing disaster resilience.

13.2 CWS Japan's Approach to Capturing Disaster Lessons

CWS Japan first decided to conduct a research and publish a report with the key lessons after the Western Japan flood in July 2018. The report "Lessons from Mabi"

(Das 2019) was published in January 2019, six months after the disaster, in collaboration with Keio University. CWS Japan had responded to this disaster in collaboration with its JPF and Act Alliance partners in Okayama prefecture, focusing on a severely affected town called Mabi. Although the research was done by CWS Japan, the data was collected through close collaboration with academics, city officials, NGO representatives, and field workers. The second report "Towards Mabi's Recovery" (Alexander et al. 2019) was published in July 2019, one year after the disaster, which focused on the recovery of the communities. The same year in October, many parts of Japan were affected by one of the largest typhoons formed in the Pacific, and CWS Japan published its third report "Lessons from Hagibis" (Das et al. 2020a) in March 2020. When the southern prefectures of Japan became severely affected after heavy rainfall in early July of 2020, CWS Japan decided to respond in the severely affected areas of Kumamoto prefecture through its ACT Japan Forum partners, and soon after this decision, started a research to capture the valuable lessons from this complicated disaster. The findings of this research were published in CWS Japan's fourth report titled "Disaster During a Pandemic: Lessons from 2020 Flooding in South Japan" (Das et al. 2020b) in January 2021. Although doing this research during a global crisis was not easy, because of its strong commitment to capturing disaster lessons, CWS Japan worked relentlessly with four universities to see this report to its completion, with a hope to bring to light the complex impacts and management implications of cascading disasters. This chapter builds on the findings of this CWS report[1] and highlights the areas where the collaboration between civil society and universities has been crucial for its research.

13.3 Civil Society and University Partnership: Capturing Evidence for Strengthening Risk Governance

When the COVID-19 pandemic started spreading in Japan in early 2020, the biggest concern for DRR researchers and practitioners was to manage a disaster under the strict restrictions around hygiene, social distancing, and so on. The challenges the restrictions could pose, and the ways they could complicate the response, could only be estimated hypothetically. In March 2020, a group of researchers from University of Mie and University of Kochi published a guideline (Koyama et al. 2020) for creating counter measures to deal with this complicated situation of cascading disaster. The Cabinet office of Government of Japan published a new guideline on shelter management[2] in June (revised in September), where it discussed issues such as how to create social distancing within the shelter, and ensure adequate cleanliness and sanitation in its facilities. Because of the unforeseeable complications that could possibly rise from this unique situation, it became really important for all concerned government and non-government parties to work closely together (Fig. 13.1).

On July 4, 2020, the southern prefectures of Japan, particularly Kumamoto and Kagoshima, experienced record-breaking heavy rain, which caused devastating

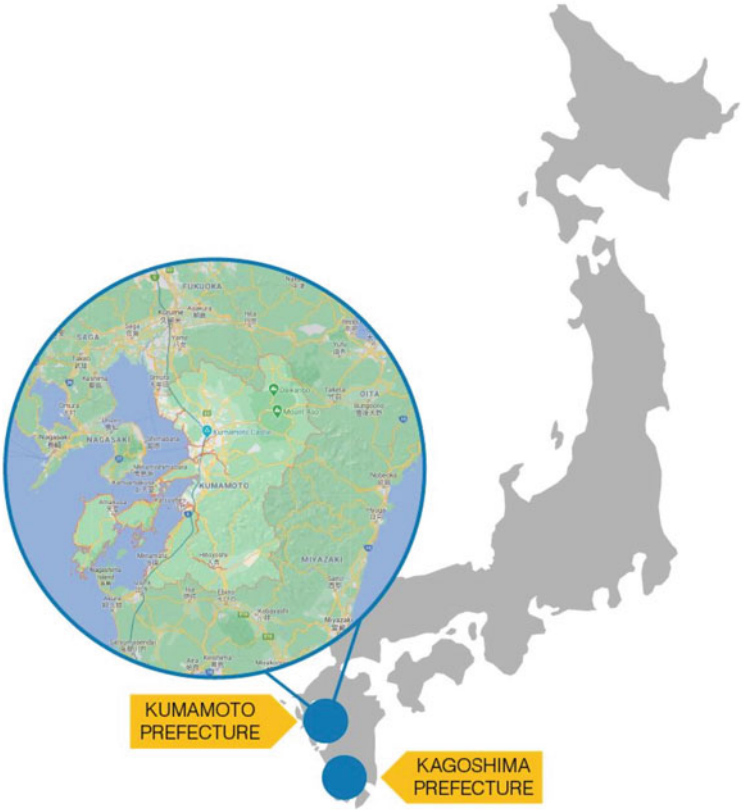


Fig. 13.1 Map showing location of Kumamoto prefecture (*Source* CWS Japan)

floods and landslides in many areas of these prefectures. It is worth mentioning here that Kumamoto was hit by a damaging 7.0 magnitude earthquake in 2016, which caused widespread damage in and around Kumamoto city. Kumamoto prefecture has been prone to flooding almost every time there is heavy rainfall in the region, which, because of its geographic location, happens very often. A dam was proposed as a flood control measure after the prefecture was hit by heavy floods for three years in a row, from 1963 to 1965; however, the project was canceled in 2009 followed by protest from local authorities. After the July 2020 flooding, which caused extremely severe damages and took 65 lives from Kumamoto prefecture alone, and after it was shown through calculation[3] to what extent the dam could save the damages, the project was reinitiated with modifications.

After careful consideration with its partners from four universities, CWS Japan decided to focus on four issues to capture the key lessons: evacuation, management of evacuation shelters, volunteer management, and early recovery. The lessons have been described in the following sections under each focus.

13.4 Focus 1: Evacuation

The large number of deaths from the July 2020 flooding can be linked to people's inability to find a suitable place to evacuate, since the capacity of the designated evacuation shelters reduced significantly to ensure adequate social distancing among the evacuees. Additionally, there were some who were hesitant to leave their houses to avoid the *Three C's*.[4] It was discussed in CWS Japan's first report "*Lessons from Mabi*"1 (see page 14, Issue 4) that there are various reasons why people are often reluctant to evacuate—such as inadequate risk communication, underestimation of danger, physical inability, and lack of information about where or how to go. Because of the COVID-19 pandemic, the dilemma and confusion regarding where and how to evacuate, or whether to evacuate at all, had intensified manifolds. The limited amount of space that could actually be managed within the evacuation shelters after following the social distancing guidelines were intended for people who want to or have no choice but to seek shelter there, and it was in a way expected that most others would opt not to go to a designated emergency shelter for fear of getting infected. It was advised that people find other options, such as accommodation facilities like hotels or inns, or friend and relative's houses and so on in the safe zones as an alternative. Unfortunately, according to the interviews conducted for this research, things did not go as intended. People started pouring in there as the warnings were announced repeatedly, and the shelters filled within a matter of hours leaving the rest, including many elderly residents, with no place to go. Some were denied access, some were allowed under special consideration, but the rest went back home finding no other option (Fig. 13.2).

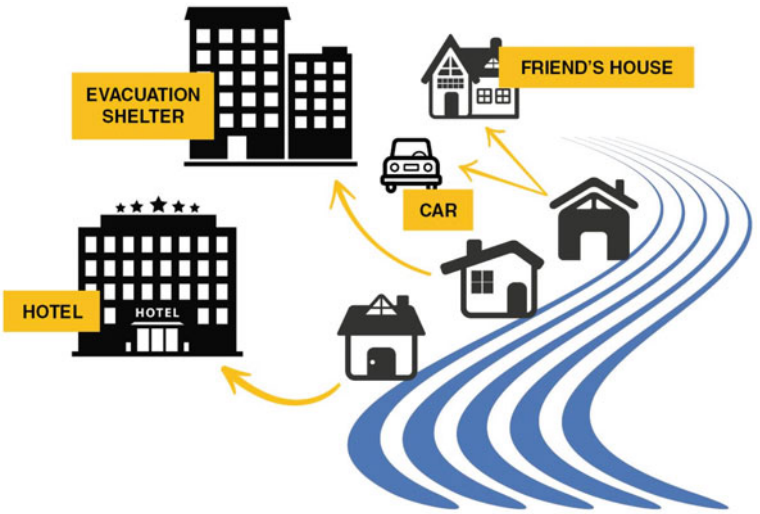


Fig. 13.2 Simulation of dispersed evacuation (*Source* CWS Japan)

The biggest dilemma, however, about whether to look for an emergency shelter or to just stay put during the July 2020 flood, was faced by families that had one or more members who needed special care, such as elderlies or persons with disabilities. According to one of the researchers, who is an expert on Disaster Nursing and Healthcare, evacuation itself could pose a risk to those members, as the moves could cause injury or destabilization of long-term care plans. Besides, the conditions in evacuation shelters, quite understandably, fall short of those in clinics and nursing homes by far—especially in terms of ensuring the protection against a deadly virus. It was, therefore, a tough decision for those who provide care to elderly, or people with disabilities or pre-existing conditions, and hence they took their time in making the move. In case of Senju-en Nursing Home in Kumamoto, where 14 residents died after the first and second floors were submerged by the flooding in the early morning of July 4 during this disaster, it was too late by the time the six on-duty caregivers tried to carry the 60 residents, most of whom were bed-ridden, to the upper floors. The researchers noted this very unfortunate case as an indicator of urgency to rethink and reinforce evacuation plans for facilities like Senju-en Nursing Home. It has been repeatedly seen in the recent years that those who do these drills have been able to pull it through the worst of disasters without any fatality.

What is most concerning is that cases like Senju-en are not rare at all in Japan. According to the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), as many as 67,000 nursing homes and clinics across the country for people who require special care are located near rivers and are at risk of flooding. All of these facilities are obliged to prepare an emergency evacuation plan and conduct emergency drills, but according to MLIT, only 35.6% of facilities nationwide had such plans in place as of March 2019. In the southern prefectures of Japan, the percentage was even lower at 24.2%, with the ratio in five of the seven prefectures lower than the nation's average. In the second report published by CWS Japan on the recovery of Mabi town2, the authors emphasized the importance of a good evacuation plan and periodic drills in saving lives, especially of people who need special care and support. This issue came to the forefront after the case of Senju-en Nursing Home in July 2020, and the authors have recommended that it is addressed with adequate urgency all over the country.

Another issue that came up repeatedly through the researches supported by CWS Japan so far is under-utilization of "Hazard Maps." In Japan, a 2005 law obligates city and town authorities to create these maps that outline areas at the risk of flooding and landslides. The hazard maps are still a work in progress, especially in South Japan, where only 23.1% municipalities have finished making the maps as of November 2019, with Kumamoto being the second lowest at 9.5%. However, even on the maps that have been published so far, almost all the areas that were affected by the July 2020 flood were marked as high risk. Not only that, about 80% of the total casualties occurred in areas that were already marked as high risk in the hazard maps. This shows that the flood risk maps are not being carefully checked by the residents and the communities. The same issue came out during CWS Japan's 2018 research on the Western Japan flood1 (see page 8, Issue: 1). These maps are usually issued on paper and are often very difficult to understand for the common people. Understanding

disaster risk is the first Priority for Action in Sendai Framework for Disaster Risk Reduction (SFDRR) and is essential for prevention of fatalities and damage. There are about 5,000 buildings along the Kuma River, from the upstream to the downstream, and most of them are in Kuma village and Hitoyoshi town, where the damages were the most severe. It is quite possible that a large number of the people living in these high-risk areas did not have a proper understanding of the risk, and thus did not take the right action for timely evacuation.

13.5 Focus 2: Management of Evacuation Shelters

The second focus of this research was management of evacuation shelters. In Japan, an evacuation shelter is not merely a safe building that provides emergency shelter for people at risk of being affected by a disaster—it is also a place that provides the evacuees with all kinds of help and support till they are able to manage on their own. Management of these shelters require a team of people with varied experience and expertise, many of whom are often affected by the disasters themselves. One of the researchers, who was also an expert on Disaster Healthcare, stated that the people in charge of shelter management, as well as the government officers dispatched to the shelters to look over the management, are often over-worked, especially during the first few weeks after the disaster. In the past, there have been cases of serious stress-related illnesses, and even suicides, among the officers who were on emergency duty, and this problem is likely to have intensified because of the additional work due to the COVID-19 pandemic.

During the brief field visit and interviews conducted for this research, it was found that the pandemic has affected the "soft" aspects of the shelter management, which are not visible to the eye, but have lasting effects and consequences. Because of the restriction on entrance, many skilled volunteers such as disaster nurses, who could offer help in various ways, were not able to visit inside the shelters. The members of these additional teams reach out to the evacuees and can detect a case of stress or fatigue related illness simply by looking at a person or exchanging greetings. People often evacuate without taking their medicines and healthcare items, and their condition often deteriorates irreversibly at the shelters by the time the necessary medicines arrive. Left undetected and untreated, these cases may end up in disaster-related deaths, which are not small in number even if only the reported cases are considered. The initial medical care during the first few days is, of course, provided by medical associations such as Disaster Medical Association Team (DMAT), who often have to brave extreme conditions to reach people in need of emergency care. The shelter management also provides health-related support, with instructions from the Health Department, but unless there is a healthcare professional in the team, they do that only after a problem is reported—by when it is usually quite late. The healthcare volunteers, on the other hand, reach out to people, talk to them or give them a massage, for example, and can detect a problem before a person recognizes it himself or herself.

The supplies at the evacuation shelters were affected too, according to the management authority of one of the shelters, who were interviewed during the field visit. The distribution of food was contracted to one local company since there was no other within the area that could supply such a large number of packed food each day for an indefinite time. Unlike other disasters, restaurant owners from within or outside the prefecture were not allowed to open soup kitchens to distribute warm food to prevent the virus. For a short stay this may not seem like a big problem, but in a perspective of several months, this affects the nutrition level of the evacuees, making them vulnerable to chronic diseases. There is also a long-term psychological impact of not having any variation of food that, one researcher indicated, is often overlooked. The situation started changing slowly toward the end of September, when other companies were included in the contract.

There were certain other issues regarding shelter management in case of July 2020 flood that are easily overlooked, such as the issue of Internet connectivity. Since the evacuation shelters are usually multipurpose halls of public schools, they are not supposed to have Internet connectivity under normal conditions. However, all the information and applications—starting from temporary shelters to reconstruction subsidies—were available online, which is where most people were expected to access them to avoid physical visits. Especially at gathering places, where important information is exchanged among the affected people, an Internet connection is almost indispensable. Unfortunately, after July 2020 flood, no one seemed to be ready to take the responsibility of providing the Internet connection during the first few months. This could potentially affect the recovery process at individual level, especially in case of elderlies, who need support to operate their devices. It is worth mentioning that the government app designed for COVID-19 contact tracing does not function without good Internet connection at all gathering places.

One of the biggest challenges of July 2020 flood response was to reach the people who could not find a place in the designated shelters. Many affected people were forced to live in all kinds of difficult conditions, including cars and partially damaged houses for weeks. According to some volunteer organizations, people who stayed in non-designated emergency shelters, including those who stayed at home and in the cars, were three or four times more than those who stayed inside the evacuation shelters. The new government guideline talks about considering ways to help these people (e.g., page 18, section 7(3) about food distribution), but there is no further instruction. It is essential to make adequate provision of support in the guideline for such people for future cascading disasters.

The new regulations did not always complicate the existing problems—there have been some examples where the problems were solved by the new regulations. In terms of cleanliness and hygiene, for instance, the evacuation shelters managed far better, thanks to the increased awareness and action on all parts. According to the shelter management authority interviewed during the field visit, only the designated people were allowed inside, after a temperature check and sanitizing of hands. The separate areas for people who need special care were off limits for everyone except the caregivers, and they followed a strict level of sanitizing process before entering the area. There has been no report of an outbreak—COVID-19 or otherwise—at

the evacuation shelters in 2020. The practice of additional cleanliness and hygiene, therefore, can be incorporated in the original shelter management guideline to prevent outbreaks at evacuation shelters.

13.6 Focus 3: Volunteer Management

The restriction on people coming in from outside the prefecture because of the pandemic caused a serious shortage of volunteers during the first six weeks after the disaster. The first responders were mainly organizations that were already active inside the prefecture, most of whom formed after the 2016 Kumamoto earthquake. Organizations like Kumamoto Young Women's Christian Association (YWCA) started their activities right after the disaster and played the important role of connecting organizations from outside the prefecture, including CWS Japan, to the affected people. Large organizations that have the capacity to handle volunteer management joined much later, toward the third week of August. Volunteers willing to help needed to clear certain conditions that confirmed that they neither carried the virus nor came in close contact with it and were asked to follow a series of preparatory health routine, such as checking temperature at regular intervals. Moreover, they were expected to follow the guidelines published by JVOAD[5] at all times and were given a simple orientation after their registration was confirmed. Each volunteer had to maintain a record of their activities and locations and share it every day via online documentation. Because of all the restrictions, there was, quite understandably, a shortage of volunteers since the beginning, and this severely affected the initial cleaning.

During the field visit of this research, however, it was found that the restrictions had some positive effects too. Firstly, it was relatively easy to manage the volunteers because of the small number. Secondly, because of the strict health check rules, there was no reported case of sickness or heat-stroke among the volunteers, which has been quite a common occurrence in case of disasters that come in summer. The volunteers took good care of their health, and when they came to help, they came well-fed and well-rested. Thirdly, because there were unmet help needs among the evacuees due to the shortage of volunteers, they tended to do many things by themselves. This can lead to a paradigm shift in how the need of volunteers is perceived in Japan and can also result in better and stronger community resilience.

When it comes to any kind of humanitarian support, coordination is the key. Kumamoto Voluntary Organizations Active in Disaster (KVOAD) played an invaluable role of coordinating the response by creating a common platform where all organizations could share their activities and can learn about the others' latest updates. KVOAD was founded after the 2016 earthquake in Kumamoto, after its Director Mr. Tsutomu Higuchi realized the need for a form of intermediatory support organization while working on environmental improvements for 118 evacuation shelters around Japan. Before the pandemic the meetings were held at Kumamoto Prefecture's Social Welfare Association office, but in case of the 2020 flood, the meetings

took place online. The online meetings, as it came out from the interview, had some other positive sides too, than protection from the virus. The organizations could not only meet needs with support more quickly, but they could also share information with members all over Japan in real time and receive advice immediately.

To cope with the issue of shortage of volunteers, a group of local organizations started a project called "The Kuma Recovery Project."[6] The model principally involved three parties: (1) areas where volunteers were needed (mostly for cleaning work), (2) potential volunteers, recruited from those who lost their business or jobs to the disaster, (3) contributors and fund-providers. The potential volunteers who satisfied the criteria could apply through the website for a particular date and place. When their work was done, they were given a small amount of daily allowance from the fund created by the contributors. Bus rides were provided between major areas for their transport, and updates of the work were posted regularly on the website. This project was a very good example of Adaptive Governance Mechanism.[7] One of the researchers suggested that time has come to examine at each disaster-prone area the minimum manpower required for the cleaning and reconstruction work, both from inside and outside the prefecture. Local businesses and private companies also need to actively contribute in the "manpower-bank," the way they have done for the Kuma Recovery Project.

13.7 Focus 4: Early Recovery

As discussed in the previous section, the cleaning and early recovery efforts were severely affected because of shortage of volunteers. The vast areas that were inundated needed to be cleaned, and the damaged buildings needed to be washed and repaired. Businesses had to be restored. It was not possible to take on such a vast scale of work without help from all over the country. River rafting, for example, around which a large part of the tourism industry is built along the Kuma River, cannot run unless the river is fully cleaned, and the damaged facilities are reconstructed. Without adequate volunteer help, the owners and the local government had no choice but to wait for support from the central government.

The early phase of the recovery, after any disaster, is largely focused on relocation of the displaced people from the emergency evacuation shelters to temporary shelters. In case of July 2020 flooding, this part progressed quite smoothly, possibly because the prefecture had rebuilt from a massive earthquake in 2016. The construction of 808 units of prefabricated temporary houses at 24 group housing in 7 villages and towns was all complete by early December. The affected families started moving into the temporary houses since as early as late-August. Compared to the 2016 earthquake in the same prefecture, when it took about 6 months for the evacuees to start moving in, the progress of the construction was notably fast. Apart from the prefabricated temporary houses, the affected families who satisfy certain criteria were given rental subsidy for empty houses and apartments. Interviews during the field visit in September 2020 revealed that plans were also under way for a new group

housing for people who needed special care, where trained caregivers who lost their jobs because of the disaster would look after the residents.

13.8 Specific Cases of Academic Contribution to Disaster Management

As seen after every disaster in Japan, students responded very actively after the July 2020 flooding. A professor at Kumamoto University, who is in charge of the volunteer activities by the students there, collaborated with the research supported by CWS Japan. She reflected that if a strong collaboration between Civil Society Organizations (CSO) and universities can be established, the participation of students in such activities will be much easier and safer—particularly in situations like the COVID-19 pandemic. Moreover, the students will learn much more because of the direct involvement with the organizations. This will also help the CSOs have access to expert knowledge for better implementation of their programs. Under the current system, the students usually take part through the students' volunteer groups within the university, or through organizations like *Gakusei* (meaning student) Volunteer[8] or Open Japan,[9] who connect them with the shelter management. According to the professor who collaborated with the CWS research, no laboratory at Kumamoto University has any direct collaboration or agreement with any CSO to the best of her knowledge.

Tokyo University also supports disaster affected communities through its scientific researches in various field including the functions of urban environment-related facilities such as water and sewage and waste treatment, the impact of high radiation exposure on the agricultural, livestock, and fishery industry, establishing a collaborative base for research and proposition for inheriting memories of the tsunami caused by the Great East Japan Earthquake and Tsunami appropriately for future crisis situations.[10]

On COVID-19 response, Kobe City College of Nursing filled critical needs of Kobe City in its services for the residents (Yamazaki and Iwamoto 2020). As COVID-19 cases rose, Kobe City had to secure appropriate number of nurses for its telephone consultations services as well as medical facility with accommodation function, and the collaboration enabled collaboration on assessing the situation and to forecast the future scenario, and to reflect the experience and insights into further education to students who will become future nurses. Science Council of Japan also calls for such collaboration between academia and wider society to nurture localized comprehensive care system.[11]

13.9 Recommendations for the Future: NGO Perspective on Partnership with Universities

Multi-sectoral collaboration between NGOs and universities is critical when capturing lessons and evidence for further enhancing disaster resilience, and there are ways to strengthen such partnership. Some recommendations, from NGO perspective, are noted below.

- Strengthening relationship from non-disaster time: NGOs can provide its experiences and resources in order to assist the learning environment within universities, and there are joint researches that could be done in non-disaster times. It is beneficial to increase such interaction as much as possible so that both sides understand the value of the other.
- Publish joint publications: understanding cascading nature of disaster risks would require unpacking how one disaster risk relates to the other, and to the complex nature of socioeconomic vulnerabilities of a specific segment of the society. NGOs can bring on-the-ground experiences, but often fail to see invisible nature of cascading risks from analytical perspective. Therefore, publishing academic papers would allow both on-the-ground experience and analytical perspectives to untie the complex phenomenon of cascading disaster risks.
- Make use of existing networks: networks that focus on DRR, for example, Japan CSO Coalition for Disaster Risk Reduction (JCC-DRR) or Asian Disaster Reduction and Response Network (ADRRN), are well-positioned to stimulate discussions on certain challenges within DRR field. For example, there is a group within JCC-DRR that focuses on advocating for inclusivity and diversity for better protection of vulnerable population; the group is comprised of both practitioners and academics.

13.10 Conclusion

When assessing the disaster risks for a specific community, one needs to look at pre-existing vulnerabilities, exposure to hazards, and strengths of the community prior to the disaster event, and this requires collaboration and perspectives from various segments of the society. The Sendai Framework also calls for more dedicated action on "tackling underlying disaster risk drivers, such as the consequences of poverty and inequality, climate change and variability, unplanned and rapid urbanization, poor land management and compounding factors such as demographic change, weak institutional arrangements, non-risk-informed policies, lack of regulation and incentives for private disaster risk reduction investment, complex supply chains, limited availability of technology, unsustainable uses of natural resources, declining ecosystems, pandemics and epidemics."[12]

However, it is extremely challenging to do such analysis by a single stakeholder, and it often requires collaboration between local authority, academia, civil society,

and private sector. For example, OECD's "How's Life" framework[13] lists areas such as health, education and skills, social connections, empowerment and participation, environmental conditions, vulnerabilities, life evaluation, feelings and meaning, consumption possibilities, jobs, housing and infrastructure to assess individual well-being. In addition, it encourages to look into natural capital, human capital, economic capital, and social capital to assess sustainability of well-being over time. When considering all these factors while conducting pre-disaster assessment on pre-existing vulnerabilities, exposure to hazards, and strength of the community, it is inevitable to strengthen multi-sectoral collaboration, bringing science from each field of expertise for ultimate aim of public good.

CWS Japan's approach in capturing lessons learnt in collaboration with academia is a small step in the sector, but it believes that the direction for such multi-sectoral collaboration is critical for resilience building in the age of New Normal.

Notes

1. Parts of this chapter is a revised/edited version of "Disaster During a Pandemic: Lessons from 2020 Flooding in South Japan".
2. Can be viewed from the website of the Cabinet Office (in Japanese): http://www.bousai.go.jp/pdf/covid19_tsuuchi.pdf.
3. Page 37 of the following document shows an estimation compiled by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) through the percentage of area that could be saved if the dam was built as planned (in Japanese, source MLIT's website): http://www.qsr.mlit.go.jp/yatusiro/site_files/file/bousai/gouukensho/20201006shiryou2.pdf.
4. The Three C's: **C**losed spaces, **C**rowded places, **C**lose-contact settings. See Ministry of Health, Labor and Welfare's (MHLW) poster available online: https://www.mhlw.go.jp/content/10900000/000619576.pdf.
5. JVOAD guideline for volunteers available online: http://jvoad.jp/wp-content/uploads/2020/07/8cd983a87eb1934dda02d44a9e08b07a.pdf.
6. Details can be viewed from the website of the Kuma recovery project (in Japanese): https://peraichi.com/landing_pages/view/kumamoto-revival3.
7. "Adaptive governance is an emergent form of environmental governance that is increasingly called upon by scholars and practitioners to coordinate resource management regimes in the face of the complexity and uncertainty associated with rapid environmental change" Chaffin B, Gosnell H, Cosens B, A decade of adaptive governance scholarship: synthesis and future directions, Ecol Soc 19(3), article 56. Available online: https://www.ecologyandsociety.org/vol19/iss3/art56/.
8. Website of *Gakusei* Volunteer (in Japanese): http://gakuvo.jp/ (for the last couple of years *Gakusei* Volunteer has been the first window for the students who are interested to volunteer).
9. Website of Open Japan (in Japanese): http://openjapan.net/ (it is usually *Gakusei* Volunteer who connects the students to Open Japan, who then connects them to wherever they are needed. They also provide the necessary fund,

equipment [helmets etc.] for the volunteer work. Kumamoto University has an official agreement with Open Japan for this purpose).

10. Source: Website of The University of Tokyo: https://www.u-tokyo.ac.jp/ja/society/aid/project_list.html.
11. Website of the Science Council of Japan: http://www.scj.go.jp/ja/info/kohyo/kohyo-24-t292-8-abstract.html.
12. Sendai Framework for Disaster Risk Reduction 2015–2030; available at Preventionweb: https://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf.
13. Website of The Organisation for Economic Co-operation and Development (OECD): https://www.oecd.org/development/mdcr/howslife/.

References

Alexander J, Das S, Ishiwatari M, Kanbara S, Izumi T, Komino T, Sakurai A, Shaw R (2019) Towards Mabi's recovery—lessons one year on. CWS Japan, Tokyo, p 25. Available online: https://www.cwsjapan.org/wp-content/uploads/2019/09/Towards-Mabis-Recovery.pdf

Das S (2019) Six months since Western Japan flood: lessons from Mabi. CWS Japan, Tokyo, p 28. Available online: https://www.cwsjapan.org/wp-content/uploads/2019/03/Lessons-From-Mabi.pdf

Das S, Alexander J, Ishiwatari M, Komino T, Shaw R (2020a) Lessons from Hagibis: learning to cope with intensifying disasters in the age of new normal. CWS Japan, Tokyo, p 24. Available online: https://www.cwsjapan.org/wp-content/uploads/2020a/03/Lessons-from-Hagibis.pdf

Das S, Shaw R, Kanbara S, Abe M, Komino T (2020b, December) Disaster during a pandemic—lessons from 2020b flooding in South Japan. CWS Japan, Tokyo, p 40. Available online: https://cwsglobal.org/wp-content/uploads/2021/01/Disaster-During-a-Pandemic-1.6.2021.pdf

Koyama M, Kanbara S, Minamisawa K (2020, March 27) A guideline for creation of countermeasures against flood disaster during a pandemic situation (COVID-19), 2nd edn. Available online: https://www.pwri.go.jp/icharm/special_topic/20200625_flood_response_collection_e/COVID-19Guideline_20200527-2ENG.pdf

Yamazaki H, Iwamoto S (November 2020) A collaborative approach to tackle the COVID-19 pandemic between Kobe city and Kobe Nursing University. Hokenshi J 76(11). Available online: https://webview.isho.jp/journal/detail/abs/10.11477/mf.1664201544

Chapter 14
Private Sector and Higher Educational Institution Partnerships to Enhance Resilience in the Philippines: The Experience of the National Resilience Council

Antoni Yulo Loyzaga, Noralene Uy, Dexter Lo, and Emma Porio

Abstract By their concentrated scientific knowledge, technical expertise, organizational infrastructure, and material resources, the private sector and higher education institutions play a pivotal role in disaster risk reduction and resilience, being co-owners of risk as well as co-creators and co-implementers of solutions to resilience challenges. The impact and influence that the private sector and higher education institutions possess inform and catalyze evidence-informed decision-making in risk reduction across sectors, at different levels, and beyond their specific geographic locations. The COVID-19 pandemic provided an opportunity for higher education institutions and the private sector to mobilize resources and initiatives to support the government response. The experience of the National Resilience Council and its academic partners in implementing resilience programs in the Philippines shows that multi-stakeholder participation, trust-building, communication, information sharing, partnership, and social transformation provide the enabling conditions to enhance the resilience of higher education institutions. Post-COVID-19, the private sector and higher education institutions can leverage and strengthen existing partnerships and explore opportunities for future collaborations to build resilient societies. The private sector and higher education institutions continue to play an essential role in facilitating disaster risk reduction and resilience actions that foster transformation toward resilient development pathways.

A. Yulo Loyzaga (✉)
National Resilience Council, Pasay City, Philippines
e-mail: aloyzaga@observatory.ph

N. Uy
Ateneo de Manila University, Quezon City, Philippines

D. Lo
Xavier University, Cagayan de Oro, Philippines

E. Porio
Ateneo de Manila University, Quezon City, Philippines

T. Izumi et al. (eds.), *Safety and Resilience of Higher Educational Institutions*,
Disaster Risk Reduction,
https://doi.org/10.1007/978-981-19-1193-4_14

Keywords Private sector · Higher education institution · Resilience · Pandemic risk · Partnership

14.1 Introduction

The post-2015 development agenda highlights the intersecting goals of the Sendai Framework for Disaster Risk Reduction (Sendai Framework), the Paris Agreement, and the Sustainable Development Goals. From a risk perspective, the Sendai Framework connects these international agreements to reduce existing risks, prevents the creation of new risks, and builds resilience (Mizutori 2019). Reducing vulnerability and enhancing resilience lie at the core of actions on disaster risk reduction (DRR), climate change adaptation, and sustainable development goals (UNFCCC 2017). For DRR, it was a shift from understanding and mitigating hazards and providing relief from direct impacts to understanding risks from all hazards with a systems lens and transdisciplinary approach. A heightened interest in resilience developed with a focus on science, technology, and innovation and bouncing forward by increasing capacities (i.e., prevention, anticipation, absorption, adaptation, and transformation) (Manyena et al. 2019). There was also the attention to addressing development trajectories that increase exposure and vulnerability and create complex, compound, and cascading risks (Opitz-Stapleton et al. 2019), such as the Fukushima Dai-ichi natural-technological disaster and typhoon coinciding with COVID-19.

The Philippines has been frequently referred to as a "laboratory" for disasters. It is vulnerable to multiple hazards such as typhoons, floods, earthquakes, volcanic eruptions, and droughts, among others, including recently biological hazards such as COVID-19. COVID-19 in the Philippines is one of the highest in East Asia and the Pacific and one of the top 20 globally, according to a World Bank survey. Among the impacts include an 8.1 percent projected reduction in 2020 Gross Domestic Product, unemployment at 17.5 percent in April 2020, a 1.4 percent decrease in remittances due to the displacement of overseas Filipino workers in Quarter 1–3 of 2020, around 37 percent of households in the poorest quintile without food, and an additional 2.7 million people are likely to become poor (World Bank 2020a, 2020b). COVID-19 also highlighted the growing concern on complex, cascading, and compounding risks that can exacerbate the impacts of COVID-19 and slow down societal recovery (CRED 2020). The Philippines was struck by a series of typhoons only weeks apart in the last quarter of 2020 while the country was in the middle of the COVID-19 pandemic, and regions were under different levels of community quarantine. Super Typhoon Goni and Typhoon Vamco challenged emergency response and humanitarian assistance due to the many areas affected and evacuation concerns relating to physical distancing and isolation of COVID-19 patients.

Resilience can be defined as the capacity for inclusive prevention, preparedness, response, and sustainable recovery from shocks in uncertain times. It is enshrined in the Philippine Development Plan, the National Security Strategy, the National

Disaster Risk Reduction and Management Plan, the National Climate Change Adaptation Plan, and local policies and programs. These plans, however, have scant mention of pandemic risk (Madhav et al. 2017), much less its discussion as a component of compound hazards and cascading risk (Alexander and Pescaroli 2019). These plans were directed to known hazards and did not reflect anticipatory interrogation into what is commonly referred to as "known unknowns" and "unknown unknowns."

Test, treat, and trace (T3) is the Philippines' strategic response to battling COVID-19. Its effectiveness relies principally on the performance of a public health system that is challenged by archipelagic geography and that has generally been unprepared for health emergencies due to resource constraints, bureaucratic processes, and insufficient organizational, technical, human capacities downstream (Amit et al. 2021) These gaps in infrastructure, technical resources, diagnostic facilities, equipment, and personnel continue to be evidenced by data on case surges and testing numbers, testing and personal protective equipment supplies, utilization rates in critical care facilities and COVID-19 beds in both private and government hospitals, and the magnitude and nature of the support delivered to national and local government by the private sector and non-government organizations (Dayrit and Mendoza 2020). While COVID-19 has added new complexity and uncertainty to public–private partnerships in disaster risk reduction and management (DRRM) and resilience, it has also created new opportunities for different roles, nature, and structure of partnerships.

14.2 Role of the Private Sector and Higher Education Institution in Disaster Risk Reduction and Management, and Resilience in the Philippines

To align policy and actions to international frameworks and build on the experience of significant disaster events such as Typhoon Ketsana and Typhoon Haiyan in recent decades, DRRM policy in the Philippines has likewise evolved and created opportunities for new roles of the private sector and higher education institutions (HEIs). With the passing into law of Republic Act 10121 in 2010, the focus shifted to a comprehensive and whole-of-society approach to DRRM following the Hyogo Framework for Action priorities. Civil society organizations (CSOs) and HEIs were at the forefront of negotiating for the law's approval while the private sector maintained its role as volunteers and donors. Still, the private sector is recognized as a key actor and was provided membership in the National DRRM Council (NDRRMC). Also, the Commission on Higher Education (CHED) as a member of the NDRRMC is tasked with integrating DRRM education in the school curricula of the tertiary level of education, including the National Service Training Program (Congress of the Philippines 2009).

Izumi and Shaw (2015) identify five modalities where the private sector can have meaningful engagement in DRR: (i) direct assistance to communities, as a donor, (ii) disaster preparedness for own business, (iii) developing innovative

products based on business, technology, and expertise, (iv) joint projects with non-government organizations (NGOs), governments, and international organizations as an implementer, and (v) establishment of a private foundation, NGO, and trust. Private sector involvement in DRRM gained traction by establishing the Philippine Disaster Response Foundation to cluster and coordinate big corporations' assistance to government and communities. The private sector has mainly participated in DRRM during post-disaster response and humanitarian relief efforts as a donor and in disaster preparedness to enhance business continuity. Slowly, the shift in private sector activities from providing response and relief to prevention, mitigation, and preparedness became evident. Notable in the Typhoon Haiyan response are advisories issued by the Manila Observatory that facilitated logistics coordination and situational awareness support of DHL's logistics operations system. This has become DHL's Getting Airports Ready for Disasters global program. Similarly, Aboitiz's weather forecasting network, Weather Philippines, has been institutionalized as Manila Observatory's Climate and Weather Risk Service.

With the implementation of the 2030 global agendas locally, the private sector undertook a shift from humanitarian action, disaster preparedness to respond, the whole-of-government approach, CSO volunteerism and corporate social responsibility response to implementing DRRM with a development framework and whole-of-society approach and with resilience as the goal. Today, the private sector is involved in natural resource management, energy efficiency and transition to renewable energy, support for housing relocation, and access to health services. It sometimes aligns its efforts with the priorities of the local government unit (LGU) but often will offer what it has available to assist.

HEIs played an increasingly important role in disaster prevention, mitigation, and preparedness as well. Starting in 2012, the Department of Science and Technology (DOST) has provided funding to the state-owned University of the Philippines (UP) Diliman in three projects to support the Philippine Atmospheric, Geophysical and Astronomical Administration (PAGASA): Climate X, Project NOAH, and the Philippine microsatellite development program. DOST-PAGASA also requested a private university, the Ateneo de Manila University (ADMU), to design a degree program, the ADMU Master of Science in Atmospheric Science (MSAS) delivered by the ADMU Physics Department, to build the capacity of PAGASA scientists. The ADMU Master in Disaster Risk and Resilience (MDRR), jointly delivered by the Department of Environmental Science and the Department of Sociology and Anthropology, was offered in 2018. ADMU is still the only university offering an MSAS degree in the country, along with the MDRR. In general, universities have always responded to disasters through volunteer work and fundraising activities, and supporting rebuilding after disasters. A study by a consortium that included Xavier University-Ateneo de Cagayan (XU) offers a suite of tools toward a detailed multi-hazard risk and resilience assessment framework of school infrastructure (D'Ayala et al. 2020).

The COVID-19 pandemic provided new challenges to HEIs, which tested their resilience. The experience of XU, for example, showed how response protocols to uphold the health, welfare, and safety of its academic community were

immediately implemented. Subsequently, it launched various projects and innovations for the continuity of its academic programs, institutional functions, and its mission and commitment to social development. Work-from-home arrangements were activated, and prevention tips and notification guidelines for a comprehensive COVID-19 Health Protocol were published to address campus safety. Flexible learning was implemented, building on infrastructure and human resources available and maximizing tools and technologies for online learning. It was designed as a seamless combination of home-based education and cautious return to on-campus learning, minimizing learning interruption, ensuring learning continuity, and meeting minimum standards of government regulating bodies. Even when entry to the campus was restricted, it did not stop many of the faculty members, formators, and students to initiate and innovate COVID-19 response projects and activities under the social development or extension service cluster. For instance, XU launched an institutional response to the pandemic called #XUKontraCOVID19. Some of these were for immediate response operations, while some contribute to medium to long-term recovery and resilience strategies of the city, other LGUs, and private and business sectors.

14.3 Case Study: The National Resilience Council

The National Resilience Council (NRC) was convened in August 2017 after a series of post-Haiyan climate and disaster risk reduction conferences and consultations led by the Carlos P. Romulo Foundation and SM Prime, the United Nations Office for Disaster Risk Reduction (UNDRR) Private Sector Alliance for Disaster Resilient Societies (ARISE) lead in the Philippines. Reflective of the complex and dynamic nature of risk generation in the Philippines, it was organized to establish science and technology-based public–private partnerships to achieve climate and disaster resilience. In pursuit of a whole-of-society approach, NRC has partnership agreements with thirteen national government agencies, nine LGUs, fifteen private sector entities, ten academic and research institutions, and seven CSOs.

The NRC has four goals grounded on risk prevention, reduction, and resilience, namely: (i) build a resilient Philippines through science and technology-based public–private partnerships; (ii) enhance internal capacities of LGUs through evidence-informed risk governance; (iii) strengthen and sustain high-level collaboration between national government agencies and industry; and (iv) launch the resilience program with a core group of LGUs. It supports the activities of the Asia Science Technology and Academia Advisory Group (ASTAAG) on (i) strengthening capacities of the science, technology and academic community in disaster science, (ii) supporting governments in science-based decision-making to implement the Sendai Framework, and (iii) enhancing networking among the academic community and other stakeholders through private sector involvement. It also actively participates in UNDRR ARISE Philippines' work in energizing the private sector in

collaboration with the public sector and other stakeholders in support of the goals of the Sendai Framework.

14.3.1 Resilient Local Government Unit Program

The NRC framework was formulated to establish climate and disaster risk and resilience as a development challenge (Fig. 14.1). It recognizes the need for science and technology to understand intersecting social and physical geographies that generate risk and for evidence to inform decisions and action. Through the Resilient Local Government Unit Program (RLGUP), transdisciplinary and whole-of-society approaches are utilized that emphasize the interdependence between human development, human security and economic, environmental and infrastructure resilience. It features a practical scorecard system to measure the impact of science on policies, plans, and programs. It also focuses on an all-hazard approach, including reducing risks from pandemics such as COVID-19.

The RLGUP engages LGUs and a local HEI as an academic partner in a three-year two-track capacity building program. The three years are designed to advance knowledge and technical skills needed to Prepare, Adapt, and Transform risk toward climate and disaster resilience. The two tracks deliver intersecting curricula, workshops, coaching, and mentoring sessions in leadership and governance and science and technology for risk prevention and resilience. NRC's program establishes a formal knowledge-based role in risk reduction and prevention for academic partners through a tri-partite agreement between the LGU, the university and the council. Academic partners are engaged to generate a deeper and more localized understanding of climate and disaster risk and encourage participative decision-making. They are encouraged to leverage their current teaching and research and develop research partnerships with other universities to enhance their contributions to the LGU. They are also asked to

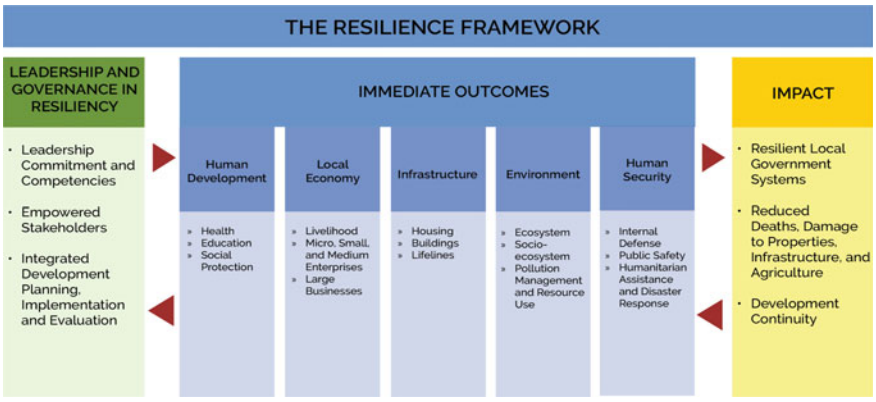


Fig. 14.1 NRC's resilience framework (*Source* NRC)

serve as a repository for learnings, design problem-focused solutions to risk and resilience challenges, and provide the knowledge, technology and technical skills needed in building an evidence-informed risk governance decision support system for the LGU and communities. Eight cities (i.e., Muntinlupa, Naga, Iriga, Ormoc, Iloilo, Cagayan de Oro, Zamboanga and Manila) and one province (Bataan) and their respective academic partners—Pamantasan ng Lungsod Muntinlupa, Ateneo de Naga University (ADNU), Visayas State University (VSU), University of the Philippines Visayas (UPV), XU, Ateneo de Zamboanga University (ADZU), ADMU and Bataan Peninsula State University (BPSU) as well as the Manila Observatory—are enrolled in the RLGUP.

14.3.2 Response to COVID-19

The NRC tapped the expertise of XU to assist the development of COVID-19 dashboards of partner LGUs to support COVID-19 response. The training was conducted, which built on the Climate and Disaster Risk Assessment (CDRA) to establish a decision support tool to respond to the COVID-19 health emergency (Box 14.1). This serves as a repository of disaster and damage and loss data and a center for analytics to inform multi-stakeholder decisions and actions.

Box 14.1: Web-GRiD Training and Dashboard The Web-based Geospatial Risk Database (Web-GRiD) is a decision support tool initially developed by XU. It was designed as a decision support tool for COVID-19 pandemic response plans and operations of the Department of Health (DOH)—Northern Mindanao Office in March 2020. Web-GRiD uses geographic-based analysis to capture the unique characteristics of a particular location at a specific time to help LGUs ensure more suitable and workable plans of action.

Together with NRC, ADMU's Coastal Cities at Risk in the Philippines: Investing in Climate and Disaster Resilience Project (CCARPH), and EpiMetrics, XU trained seven LGUs in establishing their COVID-19 dashboards that are problem-focused, solutions-driven, customized, accessible, and timely. These dashboards also include other hazards imminent and unique to each locality, such as floods, landslides, and earthquakes—capturing a multi-hazard approach and integrated risk perspective (NRC 2020; XU 2020a, b; Lorenzo 2020).

In one of the partner cities, XU facilitated the crafting of the COVID-19 Business Response and Recovery Plan, which utilized the Web-GRiD tool to analyze and develop action plans for the seven private business sub-sectors prioritized by the stakeholders. XU and NRC also partnered for a similar Web-GRiD training with special features on supply chain management for private business cooperatives to establish their dashboards (Pulido 2021).

XU and NRC continue to work with partner LGUs for a vaccine layer on their Web-GRiD dashboards to be used as a guide for local vaccination rollout. XU developed a facility location-allocation optimization toolbox that can readily be integrated into Web-GRiD. Web-GRiD has been awarded by the Philippine Council for Health Research and Development as the National Champion in the 2021 Pitch to Policymakers Competition (XU 2020c) (Fig. 14.2).

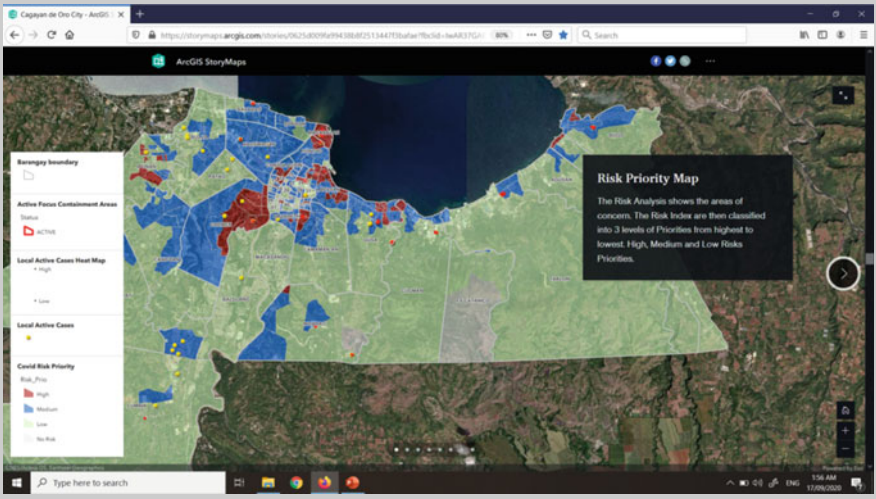


Fig. 14.2 COVID-19 dashboard developed by an LGU that underwent the Web-GRiD training. The map shows where the COVID-19 risk priority areas are in the city and the location of local active cases (*Source* XU)

In addition, NRC's COVID-19 Knowledge Series offered a deep dive into the scientific knowledge, risk governance, and situational awareness of the COVID-19 pandemic. Through informed dialogue, experts presented global and local practices and early lessons learned on effectively containing and mitigating the impacts of COVID-19. In partnership with ARISE Philippines, Zuellig Family Foundation, and Makati Business Club, NRC hosted four webinar sessions covering themes such as (i) Pandemic Frontliners: Health Emergency Practice and Crisis Leadership, (ii) Pandemic Public Safety and Security, (iii) Resilient Recovery of the Most Vulnerable: Challenges and Opportunities, and (iv) Recovery and Resilience: Re-thinking Growth Post-COVID-19. A special roundtable session was also organized on Voices from the Frontline: Bayanihan in Action. The webinars have engaged the partner academics and practitioners of the NRC in the discussion of these timely topics.

14.3.3 Strategic Engagement of HEIs in Anticipating and Mitigating Pandemic Risk

Looking into how HEIs can contribute to anticipating and mitigating pandemic risk, NRC examined the efforts of academic partners in mitigating the direct and indirect impacts of COVID-19 through teaching, research, practice and outreach. Among NRC's eight academic partners, six have schools of medicine, public health, and related healthcare disciplines such as professional health care and nursing. They have what other sectors do not have—the knowledge, expertise, and institutional capacity to mitigate the effects of the COVID-19 pandemic on health and the economy. Specifically, faculty with training in public health and epidemiology used theoretical knowledge and expertise in epidemiology to test, track, and treat the infection and be of service to the government and communities. Each one has directed institutional capacities to supplement or complement public health service delivery at the national and local level by aligning resources or contributing these directly into the government's T3 effort. Their research, professional, and outreach programs have significantly enhanced the resilience goals of human development through programs and projects focused on the continuity of education and research, disease prevention and treatment, food security, social protection, and livelihood preservation. All have digitally migrated university administration and teaching functions, enabling the continuity of education through teaching platforms while physical access to research laboratories and connectivity continue to be challenging (UN, n.d.; Cuaton 2020). In the following are the initiatives of NRC's academic partners to support local government response and recovery from COVID-19.

14.3.3.1 COVID-19 Monitoring and Risk Communication

ADMU worked with DOH, DOST, and UP to establish the Feasibility Analysis of Syndromic Surveillance using Spatio-Temporal Epidemiological Modeler (FASSTER). This dashboard was established as DOH's national and local government unit COVID-19 monitoring platform. Similarly, XU implemented the Web-based Geospatial Risk Database Project as discussed in Box 14.1, which aimed to integrate epidemiologic data with geospatial mapping to make decision-making more scientific, timely and sensible for local government officials. Monitoring and tracking epidemiologic parameters enabled the assessment of where the pandemic was going and providing valuable tools to understand the infection and prevent deaths. Communicating risk to the community was paramount leading, for example, to XU faculty joining Cagayan de Oro City government's regular public briefings to explain epidemiologic data in simple layman's terms. The analysis of real-life epidemiologic data from COVID-19 proved to be an essential resource for teaching epidemiology and its basic principles to medical students. Lastly, ADZU developed a web application to track persons suspected of COVID-19.

14.3.3.2 Transdisciplinary Research

UPV, ADNU, and XU worked with the ADMU and the Manila Observatory on intersecting climate and disaster risk assessments with COVID-19 incidence. UPV and the City Government of Iloilo noted possible associations between social vulnerability, water security, sanitation, COVID-19, and potential climate change-related hazards such as drought. UPV's support was extended to the fishing industry by preparing a policy brief on the intersection between COVID-19, climate change, and the fishing industry. This was submitted to the Philippine Council for Agriculture and Fisheries as an input to the pandemic recovery plan for the fisheries sector.

14.3.3.3 Research Support for Public Health Policy

Early policy and program research support was provided by the Ateneo School of Public Health, the UP College of Public Health and EpiMetrics as early as March 2020. Wong (ed.) (2020) presented recommendations that foreshadowed the gaps and challenges in detection, containment, and treatment that were eventually exposed at national and local levels. UPV health experts worked with practitioners as well to develop a policy brief series to help inform COVID-19 health measures in Iloilo City (Alvior et al. 2020). UPV faculty developed a policy brief for the localization of COVID-19 protocols arising from the research in CCARPH (UP System 2020); provided technical interventions to address the intersecting issues of COVID-19 and the oil spill (Lena 2020); worked with the City DRRM Office to develop strategies to attenuate the impact of COVID-19 lockdowns through mental health interventions (SunStar Iloilo 2020) and provided technical support to the COVID-19 resilience measures in Iloilo City ensuring evidence-based development planning continuity even at the time of pandemic (Local Development Council of Iloilo City and City Planning and Development Office 2021). Lastly, the VSU also published an article on "Gender Differences in the Coping Mechanisms to Disruptions Brought by COVID-19 Pandemic among Working Adults in the Rural Philippines: The Case of Visayas State University" from research on the concerns and coping mechanisms of faculty and staff to the pandemic which served as input to the COVID-19 policy of the university administration.

14.3.3.4 Equipment Production

BPSU used 3D printing to augment the government supply of face shields while the VSU produced masks and gowns as personal protective equipment. ADMU produced handwashing and water purification units to ensure water supply for protection and consumption. UPV faculty members, staff, students, and alumni engaged in developing alcohol for sanitation purposes, working with DOST to make 3D printed face shields available, and production of facemasks (Panay News 2020; Fernandez-Brojan et al. 2020).

14.3.3.5 University Hospital Facilities for COVID-19

Maria Reyna Xavier University Hospital, XU's teaching hospital, opened one of the first private Reverse Transcription Polymerase Chain Reaction (RT-PCR) laboratory in Cagayan de Oro, increasing Region 10's testing capacity and adding to the efforts to contain the COVID-19 virus. Major repairs were done on the VSU Hospital to ensure that it followed standard health protocols.

14.3.3.6 Use of Non-hospital University Facilities

State and private universities have supplemented and complemented the T3 efforts of government, private sector and NGOs by establishing testing facilities, utilizing campus facilities buildings and grounds as quarantine and isolation centers, testing facilities, and vaccine registration and administration sites within national government guidelines imposed by CHED (CHED 2020). ADMU established the Ateneo Molecular Pathology Laboratory (AMPLify) to augment the government's RT-PCR testing capacity (Lamasan 2020). It also supported the registration and administration of COVID-19 vaccination by establishing a designated site on campus. It has collaborated with the Philippine Red Cross to establish an isolation facility. Similarly, the ADZU Lantaka campus designated its converted hotel building used for educational and social development seminars and retreats as an isolation facility under the management of the Zamboanga City Health Office.

The UPV hosts the Philippine Genome Center in the Visayas, which helped the Western Visayas Medical Center (WVMC) to develop its capacity for RT- PCR testing by doing an inventory of materials needed for COVID-19 testing, loaning its equipment, sharing other materials for testing, building capacities online, and working with WVMC to establish a functional testing facility (Lena 2020). XU also rose to the challenge by being one of the first to offer its dormitories and its SEARSOLIN and Manresa Training Center to the city to be used as isolation units. It also provided the XU Grade School covered courts and XU Computer Laboratory for city social welfare department activities. The VSU Hostel and VSU Apartelle are venues for housing campus visitors, and during the pandemic, these were converted to the university in-house quarantine facilities for VSU scholars, employees, and their immediate family members who are returning from outside Leyte.

14.3.3.7 Organization and Delivery of Relief

HEIs also played a leading role in providing relief to frontline workers and communities under stress during surges and lockdowns. Food security was addressed through the delivery of food packs to those affected. VSU initiated a vegetable plantation project to support stranded students and communities affected by the restrictions. The Project "Intensifying Vegetable Production to Mitigate Crisis Brought by COVID-19" (#OplanTanimatAni) was implemented as part of VSU's extension program to

ensure food security, health and nutrition of faculty, staff, their immediate families, and students. VSU residents were encouraged to plant vegetables in their home gardens, with VSU providing the seedlings (De Veyra 2020). VSU also exported high-yielding sweet potato cuttings to farms in Mindanao to enhance the food supply and provide livelihoods to growers in Leyte (Gil 2020). Community pantry projects were launched, such as those of ADNU and ADMU. Personal kits and food pack deliveries to serve the most vulnerable communities in the area were also undertaken by ADMU and XU. UPV conducted fundraising campaigns to distribute personal protective equipment and deliver food and other community needs (Espina and Talabong 2020).

14.3.3.8 Other Support for COVID-19 Response and Early Recovery

During the response, XU provided online psychoeducation and counseling, online programs for mental health and wellness for Cagayan de Oro's frontliners, educational forums to targeted groups, home-based Learning via PARASAT Cable TV, and legal assistance to the general public. It also facilitated the development of the COVID-19 Business Response and Recovery Plan of Cagayan de Oro and supported Micro, Small, and Medium Enterprises (MSMEs) in their COVID-19 Innovative Business Recovery Plans. For UPV, the College of Fisheries launched a Sagip Pangisdaan campaign to secure the fishing industry value chain at the time of the pandemic and keep local economies moving. A component of the intervention was sharing fish processing technologies via popular and online means meant to assist home-based economic activities and MSMEs during mobility restrictions.

14.4 Enabling Conditions to Enhance the Resilience of Higher Education Institutions

Strengthening risk reduction and resilience through education is one of the essential goals of the Comprehensive School Safety Framework (UNISDR and Global Alliance for Disaster Risk Reduction and Resilience in the Education Sector 2017). Among the activities identified, which have also been undertaken and promoted by NRC in its various programs, are (i) strengthening coordination and networks for resilience at all levels, (ii) improving education governance and local participation, (iii) increasing capacities in DRR, (iv) engaging students and educators in DRR activities, and (v) developing quality teaching and learning materials. NRC's collaboration with various HEIs in implementing its DRRM and resilience initiatives indicates the many ways that the private sector can influence resilience-building, especially in the face of multiple hazards, including COVID-19. As an example, NRC's partnership with ADMU through education and training under the MDRR degree program

(Box 14.2), and transdisciplinary action research with CCARPH (Box 14.3) facilitated the application of knowledge, tools, and technologies of physical and social scientists in LGU governance processes.

Box 14.2: Master in Disaster Risk and Resilience Program The MDRR program is jointly designed and delivered by ADMU's-School of Science and Engineering-Department of Environmental Science, School of Social Sciences-Department of Sociology and Anthropology, Ateneo Innovation Center and the Manila Observatory. It aims to contribute to the goals of the Sendai Framework on science-based education and training in DRR through the UN ASTAAG and UNDRR ARISE in partnership with the private sector, government, and non-government organizations. The master program utilizes transdisciplinary approaches to prevent and reduce risk and build resilience; integrates theory, methods, and practice in the physical, social, and industrial sciences; and employs a systems lens in problem analysis and solution identification. Many of NRC's experts and partners serve as lecturers in the program's foundational courses, particularly on risk governance, development, and humanitarian action.

In July 2021, the MDRR program was recognized as one of the best in the area of environmental security, ranking 39th among 150 countries worldwide in the Eduniversal Best Masters Ranking 2021.

Box 14.3: Coastal Cities at Risk in the Philippines: Investing in Climate and Disaster Resilience Project The NRC collaborated with ADMU on the International Development Research Center-funded CCARPH Project in 2017–2021. The research grant aimed to enhance the capacity of coastal cities in Metro Manila (Valenzuela), Iloilo, and Naga through a better understanding of the complexity and dynamics of climate and disaster risk by (i) undertaking new transdisciplinary action research, (ii) building capacity of resilience scientists and practitioners, (iii) strengthening public–private partnerships, and (iv) informing the resilience plans of cities (Fig. 14.3).

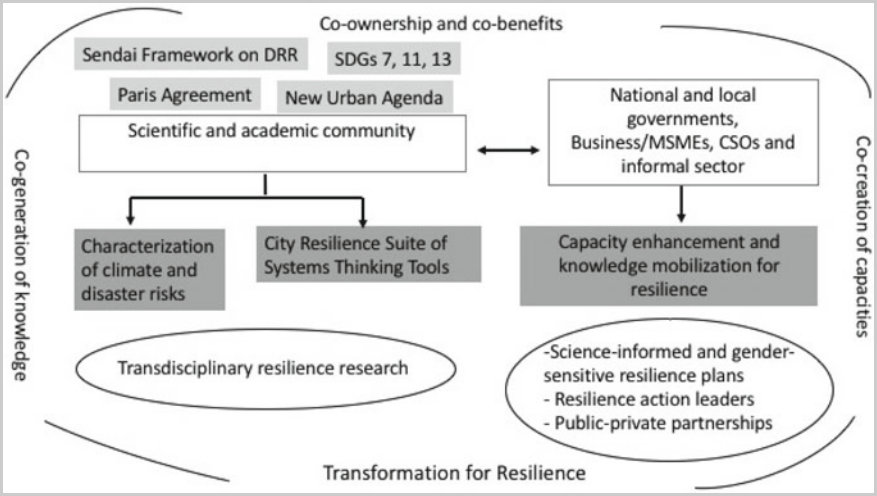


Fig. 14.3 Research analytical framework of CCARPH (*Source* CCARPH)

Science – Policy – Practice			
	Academics	Research	Extension/Application
Physical, Social and Behavioral, industrial Sciences	Core and Elective Subjects	Generation of Knowledge	Coastal Cities at Risk in the Philippines Project (CCARPH), Academic Partners, LGUs and NRC
Climate and Disaster Risk Assessment, Deepening Systems Thinking Dynamics, Choosing the Right Tools	Certificate Course	Immersion, Training and Skills Enhancement	CCARPH, Academic Partners, LGUs and NRC
BA, BS, MA/MS Master in Disaster Risk and Resilience	Degree Programs	Education, Training and co-generation of new knowledge	CCARPH, Academic Partners, LGUs and NRC

Fig. 14.4 Institutionalizing science, policy, and practice through university and private sector partnership (*Source* Adapted from the DOH-Zuellig Family Foundation Health Leadership and Governance Program implemented from 2013 to 2018 in partnership with a network of academic institutions)

Specifically, Work Theme Three of the project sought to deliver multi-stakeholder and transdisciplinary work with NRC and establish a cohort of resilience practitioners through the MDRR degree program of the ADMU.

The collaboration served as an entry point to institutionalizing science, policy and practice through research and teaching (Fig. 14.4).

The proactive manner by which the private sector tackles DRRM and resilience issues pushes HEIs outside the bounds of tradition to focus on resilience-building and find ways to interrogate risk and resilience that are responsive to the demands and realities on the ground. By doing so, it also pushes the private sector to reexamine its methods and strategies. NRC's experience points to several factors that enable the council to contribute to enhancing the resilience of HEIs, as discussed in the following.

14.4.1 Multi-stakeholder Participation

The integration of science, policy, and civil society actors in a transdisciplinary process carries its own challenges when different world views and expectations come together in a participatory manner (Cronin 2008). In the work of NRC, participation is key to co-designing solutions and leveraging on local initiatives that enable communities to become self-sufficient. Notwithstanding this, the most significant barriers to multi-stakeholder participation have been: (i) institutional silos within the LGU that result in resource, data/information and capacity gaps; (ii) adopting a whole-of-government and not a whole-of-society approach to reducing disaster risk; (iii) the lack institutional platforms and infrastructure for knowledge exchange and collaboration; (iv) the failure of the scientific community to "start where the people are"—preferring instead to advance their own research questions; (v) the failure of the private sector to assess, disclose and remedy climate-related financial risk, adopt resilience into their core business cycles and evaluate their impacts "beyond the fence lines;" and (vi) the perpetuation of disciplinal silos in universities instead of adopting transdisciplinary action research as a pathway to assisting LGUs. A multi-stakeholder platform allows the participation and contribution of various stakeholders by employing a whole-of-society approach. It is critical that stakeholders are involved in problem framing and problem solving (Gaziulusoy et al. 2016).

14.4.2 Partnership

Multi-sector and multi-level partnership and collaboration allowed for transdisciplinarity and intersectionality in interrogating vulnerability and resilience. HEIs provided science, technology and innovation (STI) while the public sector, industry, and community enabled real-life application. This contextualization and granular perspective of challenges supported the implementation of interventions based

on partners' differential capacities and investment priorities. More importantly, it encouraged the refinement of concepts, methods, and perspectives, thus transforming STI production in collaboration with partners. Transdisciplinary programs require close and continuous cooperation, networking, and knowledge transfer to other stakeholders (Cronin 2008). A productive balance between structured collaboration and vested interests by participating partners and disciplines should thus be determined (Wiesmann et al. 2008).

14.4.3 Trust-Building

NRC's experience has been that by building or enhancing trust between LGU, the private sector, academe and the CSO community, strategic shared values can be identified, and concrete interventions toward disaster prevention can be generated. This includes influencing the introduction of climate and disaster risk-related courses in curricula, private sector investments in automated weather stations for research and early warning, training in business continuity planning for MSMEs, support for assessing resilient buildings and forest conservation.

14.4.4 Information Sharing

Data and information are critical elements in the transdisciplinary work of the NRC. The availability of disaster-related information influences planning and decision-making inside and outside of the partnership. Agreements on what and how information can be shared allow for an understanding of the achievement of shared goals.

14.4.5 Communication

The NRC activities and the environments and spaces it finds itself in are complex. The dynamics within must be negotiated on an ongoing basis. Communication within partners can be challenging, however, when each brings different disciplinary perspectives and interests. This would require each partner to be open to others' views and opinions, exhibit reflexivity in considering contextual issues, and review their own assumptions and responses (Gaziulusoy et al. 2016).

14.4.6 Social Transformation

Increasing capacities of LGUs and communities in leadership and governance and science and technology is at the center of the RLGUP. Engaging and collaborating with academic partners seek to develop a cohort of practitioners with cross-discipline and -sector thinking toward evidence-informed decision-making toward resilience. Social transformation as a goal of the university aims to sensitize students who would become future resilience practitioners. It is hoped that students' real-world experiences through engagements with them in socially relevant, science-anchored, and technology-driven projects will carry a passion and drive for resilience-building when they become government officials or practitioners in various fields.

For the reopening of HEIs in the Philippines, some principles aimed at enhancing resilience can be considered including: (i) leaving no student behind, (ii) re-thinking and re-designing the teaching and learning process today without waiting for the resumption of face-to-face classes, and (iii) designing and implementing coordinating mechanisms for government and HEIs not only to ensure continuity of and access to education but also for the education to be adaptive and anticipatory to current and future risks (IESALC 2020). Using lessons learned from this pandemic, HEIs should reevaluate their institutional missions, rubrics and capacities to reflect their roles as co-implementers of public health policies and programs. Rather than wait for the government to overcome policy, organizational and resource allocation challenges,

Table 14.1 Pandemic preparedness and response activities by period

Period	Pandemic preparedness and response activity
Before a pandemic	• Stockpile building • Continuity planning • Public health workforce training • Simulation exercises • Risk transfer mechanism set-up • Situational awareness
During a pandemic	• Initial outbreak detection • Pathogen characterization or laboratory confirmation • Risk communication and community engagement • Animal disease control • Contact tracing, quarantine, and isolation • Situational awareness
After a pandemic	• Global pandemic declaration • Risk communications • Contact tracing, quarantine, and isolation • Social distancing • Stockpile deployment • Vaccine or antiviral administration • Care and treatment • Situational awareness

Source Adapted from Madhav et al. (2017)

HEIs have the capacity to contribute to the first line of defense in the prevention and mitigation of pandemic risk. It would be both strategic and practical to begin locating themselves within Table 14.1 and participating as an institutional stakeholder in enhancing resilience against disease emergence and spread.

14.5 Conclusion

Private sector involvement in DRRM has been demonstrated in different modalities, more importantly as implementers through joint projects with relevant stakeholders. Recent developments in HEIs saw DRRM and resilience being institutionalized through transdisciplinary education, research, and partnership. The impact and influence that the private sector and HEI possess inform and catalyze evidence-informed decision-making in risk reduction across sectors, at different scales, and beyond their specific geographic locations. As the COVID-19 pandemic demonstrates, there is a need for a systemic, multi-hazard approach and a whole-of-society focus on DRR (CRED and UNDRR 2020).

The experience of the National Resilience Council highlights that (i) private sector investments in resilience-based on local demand allowed for the implementation of innovative modalities beyond the conventional private sector practice, (ii) private sector partnership with the university can catalyze and sustain purposive engagement with communities on resilience initiatives in the areas of education, research, outreach and campus safety, and (iii) a whole-of-society approach, as well as a transdisciplinary approach and systems lens, formed the core of a meaningful private sector and university partnership toward enhancing the resilience of HEIs. What is evident is that HEIs are critical partners both in understanding risk that is often poorly understood and in the co-creation of contextualized evidence-informed solutions for risk governance.

In a post-COVID-19 setting, the private sector and HEIs can focus on leveraging and strengthening existing partnerships and exploring opportunities for future collaborations to build resilient societies. By providing combined timely access to geographic reach, organizational infrastructure, knowledge and expertise, material resources, and innovation, the private sector and HEIs can continue to play an essential role in facilitating whole-of-society DRRM and resilience policies and actions that foster transformation toward resilient development pathways.

References

Alexander D, Pescaroli G (2019) What are cascading disasters? UCL Open: Environment. https://doi.org/10.14324/111.444/000011.v2

Alvior H.M.L, Samson MC, Arbizo J, Padilla PI (2020) Public health data analysis and recommendations for COVID-19 in Western Visayas as of 30 April 2020. https://up.edu.ph/public-health-data-

analysis-and-recommendations-for-covid-19-in-western-visayas-as-of-30-april-2020/. Accessed 28 June 2021
Amit AML, Pepito VCF, Dayrit MM (2021) Early response to COVID-19 in the Philippines. West Pac Surveill Response J 12(1):56–60. https://doi.org/10.5365/wpsar.2020.11.1.014
Ateneo de Zamboanga University (n. d.) City gov't taps AdZU Lantaka campus to be COVID-19 isolation facility. https://www.adzu.edu.ph/city-govt-taps-adzu-lantaka-campus-to-be-covid-19-isolation-facility/. Accessed 28 June 2021
Commission on Higher Education (2020) CHED issues guidelines for LGUs establishing quarantine centers in SUCs. https://ched.gov.ph/wp-content/uploads/CHED-issues-guidelines-for-LGUs-establishing-quarantine-centers-in-SUCs.docx.pdf. Accessed 28 June 2021
Congress of the Philippines (2009) Republic Act No. 101211: an act strengthening the Philippine disaster risk reduction and management system, providing for the national disaster risk reduction and management framework and institutionalizing the national disaster risk reduction and management plan, appropriating funds therefor and for other purposes. Congress of the Philippines, Metro Manila.
Centre for Research on the Epidemiology of Disasters and United Nations Office for Disaster Risk Reduction (2020) Human cost of disasters: an overview of the last 20 years 2000–2019. UCLouvain, Brussels
CRED (2020) Cred crunch issue No. 59: COVID-19 and other disasters. UCLouvain, Brussels
Cronin K (2008) Transdisciplinary research and sustainability. Overview report prepared for the Ministry of Research, Science and Technology. Institute of Environmental Science and Research Limited. https://www.learningforsustainability.net/pubs/Transdisciplinary_Research_and_Sustainability.pdf
Cuaton GP (2020) Philippines higher education institutions in the time of COVID-19 pandemic. Revista Romaneasca pentru Educatie Multidimensionala 12(1Sup2):61–70. https://doi.org/10.18662/rrem/12.1sup2/247
D'Ayala D, Galasso C, Nassirpour A, Adhikari RK, Yamin L, Fernandez R, Lo D, Garciano L, Oreta A (2020) Resilient communities through safer schools. Intern J Disaster Risk Reduct 45. https://doi.org/10.1016/j.ijdrr.2019.101446
Dayrit MM, Mendoza RU (2020) Social cohesion vs COVID-19. Intern J Health Gov 25(3):191–203. https://doi.org/10.1108/IJHG-03-2020-0022
De Veyra JF (2020) To mitigate disruption of food supply, VSU launches #Oplan-Tanum. https://www.vsu.edu.ph/articles/news/1813-to-mitigate-disruption-of-food-supply-vsu-launches-oplan-tanum. Accessed 28 June 2021
EM-DAT (n.d.) The emergency events database - Université catholique de Louvain (UCL) - CRED, D. Guha-Sapir - www.emdat.be, Brussels, Belgium. Accessed 10 Mar 2021
Espina MP, Talabong R (2020) How Iloilo city became 'Wakanda' of the Philippines. https://www.rappler.com/newsbreak/in-depth/how-iloilo-city-became-wakanda-of-philippines. Accessed 28 June 2021
Fernandez-Brojan C, Villa HP, Burgos NP (2020) DIY face shields aid health workers in West Visayas. https://newsinfo.inquirer.net/1246237/diy-face-shields-aid-health-workers-in-west-visayas. Accessed 28 June 2021
Gaziulusoy AI, Ryan C, McGrail S, Chandler P, Twomey P (2016) Identifying and addressing challenges faced by transdisciplinary research teams in climate change research. J Clean Prod 123(55):64. https://doi.org/10.1016/j.jclepro.2015.08.049
Gil AG (2020) VSU intensifies food security efforts through root crop production amidst COVID-19. https://www.vsu.edu.ph/covid19. Accessed 28 June 2021
IESALC (2020) COVID-19 and higher education: today and tomorrow. Impact analysis, policy responses and recommendations. https://www.iesalc.unesco.org/en/wp-content/uploads/2020/04/COVID-19-EN-090420-2.pdf. Accessed 28 June 2021
Izumi T, Shaw R (2015) Overview and introduction of the private sector's role in disaster management. In: Izumi T, Shaw R (eds) Disaster management and private sectors: challenges and potentials, pp 1–10. https://doi.org/10.1007/978-4-431-55414-1

Lamasan KL (2020) AMPLify: Ateneo's way of amplifying testing and increasing innovations in health care and research. https://www.ateneo.edu/ls/sose/news/amplify-covid-19-testing-innovations-health-care-research. Accessed 28 June 2021

Lena P (2020) Coastal residents urged to help in oil spill cleanup. https://www.pna.gov.ph/articles/1108204. Accessed 28 June 2021

Local Development Council of Iloilo City and City Planning and Development Office (2021) Iloilo city comprehensive land use plan (CLUP) 2021–2029 Final draft. https://iloilocity.gov.ph/main/wp-content/uploads/2021/03/Vol1_CLUP-3-3-21-final-draft-1.pdf. Accessed 28 June 2021

Lorenzo A (2020) Private school develops Covid-19 tracker to help LGUs. https://www.pna.gov.ph/articles/1103745?fbclid=IwAR207y5Tl9E8ocaTskIfjxx6SdTY0b7PkujPvBT1gRIDnOqgFSH0VhwH2F8. Accessed on 27 Mar 2021

Madhav N, Oppenheim B, Gallivan M, Mulembakani P, Rubin E, Wolfe N (2017) Pandemics: risks, impacts, and mitigation. In: Jamison DT, Gelband H, Horton S et al (eds) Disease control priorities: improving health and reducing poverty, 3rd edn. The International Bank for Reconstruction and Development / The World Bank, Washington, DC

Manyena B, Machingura F, O'Keefe P (2019) Disaster resilience Integrated framework for transformation (DRIFT): a new approach to theorizing and operationalizing resilience. World Dev 123. https://doi.org/10.1016/j.worlddev.2019.06.011

Mizutori M (2019) From risk to resilience: pathways for sustainable development. Prog Disaster Sci 2. https://doi.org/10.1016/j.pdisas.2019.100011

National Resilience Council (2020) Web-based geospatial risk database for COVID-19 pandemic response and recovery. https://resiliencecouncil.ph/web-based-geospatial-risk-database-for-covid-19-pandemic-response-and-recovery/?fbclid=IwAR2FLYMUJzpdfPA224KLFdcJnBU1xQk9Ise3L-kClBbkeQQvwql9SoMjp1E. Accessed on 27 Mar 2021

Opitz-Stapleton S, Nadin R, Kellett J, Calderone M, Quevedo A, Peters K, Mayhew L (2019) Risk-informed development: from crisis to resilience. UNDP, New York

Panay News (2020) No alcohol? UP scientists come to the rescue. https://www.panaynews.net/no-alcohol-up-scientists-come-to-the-rescue/. Accessed 28 June 2021

Pulido VMC (2021) Xavier Ateneo's Web-GRiD resource team sustains engagement through training of cooperatives and non-profit organizations. https://www.xu.edu.ph/xavier-news/170-xu-ateneo-news-sy-2020-2021/4924-xavier-ateneo-s-web-grid-resource-team-sustains-engagement-through-training-of-cooperatives-and-non-profit-organizations. Accessed 27 Mar 2021

SunStar Iloilo (2020) Iloilo city mental health drive kicks off. https://www.sunstar.com.ph/article/1861941/ILOILO/Local-News/Iloilo-City-mental-health-drive-kicks-off. Accessed 28 June 2021

United Nations (n.d.) COVID-19 and higher education: education and science as a vaccine for the pandemic. https://www.un.org/en/academic-impact/covid-19-and-higher-education-education-and-science-vaccine-pandemic. Accessed 28 June 2021

United Nations Framework Convention on Climate Change (2017) Opportunities and options for integrating climate change adaptation with the Sustainable Development Goals and the Sendai Framework for Disaster Risk Reduction 2015–2030. FCCC/TP/2017/3. UNFCCC, Geneva

UNISDR and Global Alliance for Disaster Risk Reduction and Resilience in the Education Sector, (2017) Comprehensive school safety: a global framework in support of The Global Alliance for Disaster Risk Reduction and Resilience in the Education Sector and The Worldwide Initiative for Safe Schools. UN, Geneva

University of the Philippines System (2020) UP system report on COVID-19-related activities, 1–31 Oct 2020. https://publicservice.up.edu.ph/wp-content/uploads/2020/12/Oct-1-31-CU-report.pdf. Accessed 28 June 2021

Wiesmann U, Hirsch Hadorn G, Hoffmann-Riem, H, Biber-Klemm S, Grossen- bacher W, Joye D, Pohl C, Zemp E (2008) Enhancing transdisciplinary research: a synthesis in fifteen propositions. In: Hirsch Hadorn G, Hoffmann-Riem H, Biber-Klemm S, Grossenbacher-Mansuy W, Joye D, Pohl C, Wiesmann U, Zemp E (eds) Handbook of transdisciplinary research. Springer, Dordrecht, pp 433–441

Wong JQ (2020) Summary of technical recommendations. Prescriptions technical brief special series 1(1). Joint EpiMetrics-UPCPH-ASMPH COVID 19 study group. https://epimetrics.com.ph/assets/projects/c19/1.pdf. Accessed 28 June 2021

World Bank (2020a) Impacts of COVID-19 on households in the Philippines. Results from the Philippines COVID-19 households survey. Round 1: Aug 2020. World Bank, Washington, DC

World Bank (2020b) Impacts of COVID-19 on communities in the Philippines. Results from the Philippines COVID 19 community survey. Round 1: Aug 28–Sept 1, 2020. World Bank, Washington, DC

Xavier University (2020a) Xavier Ateneo joins the resource team for coaching and mentoring of LGUs on Web-GRiD for COVID-19. https://www.xu.edu.ph/xavier-news/170-xu-ateneo-news-sy-2020a-2021/4756-xavier-ateneo-joins-the-resource-team-for-coaching-and-mentoring-of-lgus-on-web-grid-for-covid-19. Accessed 27 Mar 2021

Xavier University (2020b) Xavier Ateneo's GRiD-DSS project lauded as model for local governance of COVID-19 pandemic. https://www.xu.edu.ph/xucovid19-infographics/4578-xavier-ateneo-s-grid-dss-project-lauded-as-model-for-local-governance-of-covid-19-pandemic2?fbclid=IwAR1jy6wDzON8B3qkV_S2WfsJPSuODBlgnKY7Ccp_OzVs73StHZ3tXWe6Pvc. Accessed 27 Mar 2021

Xavier University (2020c) Web-GRiD XU team representing Region 10 wins 1st Place in 3-minute pitch to policymakers competition. https://www.xu.edu.ph/xavier-news/170-xu-ateneo-news-sy-2020c-2021/4919-web-grid-xu-team-representing-region-10-wins-1st-place-in-3-minute-pitch-to-policymakers-competition. Accessed 27 Mar 2021

Chapter 15
Impacts, Opportunities, and Potentials in Higher Educational Institutions: During and Post Pandemic Perspectives

Rajib Shaw, Takako Izumi, and Indrajit Pal

Abstract Pandemic has affected different parts of life. Higher education institutions (HEIs) are no exception to that. With the sudden pandemic, the HEIs suffered the most in Spring and Fall semester in 2020 with disruption of classes, changing to online education, student management, etc. In this chapter, the impacts are analyzed with six different issues: (1) Closure and learning disruptions, (2) Admission and enrollment, (3) Institutional financial challenges, (4) Student support and resources, (5) Student abroad and international students and (6) Collegiate athletics. In spite of all the challenges, there are several potentials which can be explored in a positive way to enhance the capacities of HEIs. This includes: (1) Positioning ourselves in the complex risk landscape, (2) Learning the lesson of urgency, (3) Belief in science, (4) Multi, inter, trans-disciplinary: from words into action, (5) Innovation potentials, and (6) Creative risk communication. As the way forward, the chapter proposes four specific issues: (1) Inclusive BCP/ECP (business continuity plan/education continuity plan), (2) flexibility in HEIs, (3) developing a social support mechanism, and (4) spreading a message of positivity. The chapter also urges the HEIs to promote the value education, as a part of life lone learning.

Keywords Education continuity · Value education · Community immersion · Trans-disciplinary · Social innovation

R. Shaw
Graduate School of Media and Governance, Keio University, Fujisawa, Japan

T. Izumi (✉)
International Research Institute of Disaster Science, Tohoku University, Sendai, Japan
e-mail: izumi@irides.tohoku.ac.jp

I. Pal
Disaster Preparedness, Mitigation, and Management, Asian Institute of Technology, Khlong Luang, Thailand

T. Izumi et al. (eds.), *Safety and Resilience of Higher Educational Institutions*,
Disaster Risk Reduction,
https://doi.org/10.1007/978-981-19-1193-4_15

15.1 Introduction

Higher education institutions (HEIs) cover a large range of institutions, covering universities, graduate schools, colleges (junior colleges, colleges of technologies, vocational training college, community colleges, liberal art colleges, etc.) and specialized/professional training colleges, etc. In case of Japan, HEIs are defined as: "*universities, graduate schools, junior colleges, Colleges of Technology, and Professional Training Colleges (except for Prefectural Colleges of Agriculture) as well as National College of Nursing, Japan, Polytechnic University, and National Fisheries University amongst educational institutions operated by government ministries and agencies*" (MEXT 2018). Similarly, each country has its own definition with the broader guidelines depending on the nature of the education system in the country and it virtually encompasses anything above high schools.

In the overall education system, in most cases the first emphasis is given to the basic education, which is the backbone of any country; HEIs are often considered as the brain and hands of the country, which generates knowledge, inventions, innovations, systems, and gives us skilled human beings. Not only that, the HEIs produce workforces which contribute to different sectors of the society, including the basic education sectors as teacher training institutes. Therefore, any disruptions in the HEIs can affect the country's systems widely, including health, education, industries, production, or service sectors.

The global pandemic COVID-19 was an unprecedented blow to all sectors of the society, including higher education. In an interconnected society, when there is a disturbance in one part, the chain reaction affects the whole system. The closure of campus, education discontinuity, student's social and psychological stresses, job loss of their parents affecting abrupt discontinuity of the education, job loss of teaching and support staffs in the HEIs, cumulative intellectual loss, stop of the research development activities, interruption of the generation of lifesaving professionals like doctors, nurses, and other emergency workers are some of very few of this complex problem.

This chapter provides a brief analysis of the different aspects of the impacts of COVID-19 on the HEIs and also highlights some of the new opportunities and potentials it beings to address the changing global risk landscape.

15.2 Impacts of Coronavirus on HEIs

The COVID-19 impacts need to be seen in phases, very much synchronizing with the different peaks of the COVID surge in different countries. It started from cancelation of classes at the initial stage, to develop online system at the middle stage to developing blended or robust system at a later stage (THE 2020). Initially, the focus was on the safety of the students, which later turned into education continuity, gradually evolved into economic impacts in the HEIs, and finally to the large

aspects of socio-economic resilience of the society. Broadly speaking, the impacts can be divided into the following categories (Smalley 2021): (1) Closure and learning disruptions, (2) Admission and enrollment, (3) Institutional financial challenges, (4) Student support and resources, (5) Student abroad and international students, and (6) Collegiate athletics. Like many of the other sectors, initial "*infodemic"* issue also hit the HEIs. At the initial stages, there were confusion, agony, mistrust on the information. The universities with a medical school were in a better position to get expert advice from the medical/healthcare research about the future growth and spread of the virus with different simulation exercises and worst-case scenario development. However, the colleges, especially the liberal arts or technical training/vocational training institutes had to rely mostly on the government information.

The impacts of coronavirus in HEIs need to be looked at the perspectives from HEIs authorities/senior management, public authorities, business sectors (Bergan et al. 2021). However, the client perspectives which is the student perspective is always missing. There are several issues that come out of the analysis like: internationalization, finance and academic freedom, institutional autonomy, inclusion, equity, public responsibility, etc. It is also argued that the HEIs can play a vital role in post COVID recovery process. The legal perspective of the impacts of COVID-19 also needs to be looked at. Most of the HEIs did not have any specific legal guiding instrument on when to make the campus closure or when to start the campus. Also, there were several legal disputes on the school fees, etc., students demanding reduction or waiving of the school fees for certain semesters, which are online. For the residential colleges, the specific protocols, safety of the students and staffs were also additional challenges.

15.2.1 Closure and Learning Disruptions

As per the timeline, the Spring 2020 semester was the hardest hit globally, since most of the HEIs were not prepared for the pandemic. Those, who could quickly shift to online classes had less educational interruptions, however it took longer time in most of the HEIs, especially in the developing countries, where internet and information infrastructure was a major challenge, especially in the rural areas. By fall 2020, most of the HEIs could start the combination of online and on-campus classes, but again, the rural HEIs were the hardest hit. As per Smalley (2021), in the US, 44% of the institutions developed fully or primarily online instructions, 21% used a hybrid model, and 27% offered fully or primarily in-person institutions. This is fairly a representative percentage for most of the HEIs in the developed countries.

Many HEIs planned to open the campus in Spring 2021, however, different peaks of the COVID-19 prohibited them to do so. This is especially relevant for the residential institutions where extra cares need to be taken. To open the campus, many different tools were used like: increased number of in-campus testing, contact tracing, waste water survey, changing the classrooms seating arrangements, enhanced ventilation. At the beginning of the Spring 2021 semester, some HEIs have started opening

only for the smaller classes, which has less number of students and accommodate them in the larger classrooms. Also, preferences were given to the subjects, which need specific in-person training, like architecture studio or chemical laboratories or informatics using super computer analysis, etc. Many universities suspended spring break to cover the educational loss, which also raised some concerns on the mental health of the students.

In autumn 2021, several HEIs in different countries started on-campus classes, depending on the vaccination rate among the students. Proper vaccination certificate tracing has been used in many HEIs. However, the universities faced challenges because of the border closure in most of the countries, eventually prohibiting foreign students to come to the university. Thus, a hybrid education program started in most of the HEIs.

15.2.2 Admission and Enrollment

Since the start of the pandemic, there were growing concerns on the higher education enrollment. The worst sufferers were the fresh student of Spring 2020 semester, who, in most cases could not enter into the campus, and were in deep distress at the initial stage without getting much information on the higher education system, course registration, etc. at the initial stage. Universities extended admission deadlines, waving different provisions and requirement, including some of the entrance fees, etc. In spite of this, fresh student enrollment in most of the universities was affected in 2020, both in the spring and fall semesters. This was also affected in some countries like Australia, USA, UK, where the universities have significant number of overseas students. This eventually impacted some courses, closure of some of them in certain cases, and also sacking of teaching and administrative staffs in many cases. Thus, both the semesters in 2020 were dark time for most of the HEIs.

15.2.3 Institutional Financial Challenges

There were tremendous additional costs in most of the HEIs due to campus closure, establishing different new systems (like cleaning, sanitizing, installing COVID measures, return of lodging/boarding fees, new technology costs, etc.) as well as turning into online classes. And, all these came in the beginning of the fiscal year, where most of the HEIs were not prepared for. While the state/national universities had to depend on the government budgets for the additional costs, the private universities had to find new resources to sustain these additional budget costs. On one hand, the private universities could decide by themselves and started preparing or spending budget with the board approval, but it took longer time in most of the government universities to get access to new and additional budget lines.

15.2.4 Student Support and Resources

Campus closure, lockdowns in the cities non availability of in-person classes have affected the students significantly. Additional budget was also required to provide financial support to the needy students or waving fees in some cases, including issuing new scholarship schemes. In some cases, student loans had to be waived, which needed a complicated legal and technical process. Closure of the student work study program in and outside campus, the students were also financially stressed, school fee was a critical challenge, as well as to support students for their daily expenses was also crucial. Since the close of the campus was rather abrupt, there was no planned financial support in most of the HEIs in the year 2020. Drawing lessons from 2020, possibly some universities are better prepared in 2021 to address and support student needs in a continued pandemic scenario.

15.2.5 Student Abroad and International Students

Many universities suffered both the problem, where the students from the university were studying abroad under the student exchange programs, as well as incoming students from abroad. Initial safety identification of the students was quite critical. Return of those students in the home university needed additional efforts due to abrupt border closure in many countries. Students were stranded in the overseas countries for several months, and several air-lift programs were organized by respective governments. On the other hand, the universities which depend on overseas students suffered a significant blow since most of the students could not enter the country for higher studies. Visas regarding higher education were stopped for several months, or year for some cases. Students started online classes without being able to experience the campus life.

15.2.6 Collegiate Athletics

HEI based athletes, especially those who competed for the Olympics/Para Olympics within pandemic also faced the burn of the confusion and chaos. Apart from the high-profile event like Olympic, different circle activities in the HEIs were significantly affected due to closure of the campus. This continued for four semesters in some of the universities, affecting the social bonds among the students, as well as affected the major local/university/national tournaments like basketball, baseball, soccer, and other athlete meets, etc.

15.3 Opportunities and Potentials

Although the pandemic affected the whole world tremendously in terms of life loss, health impacts, economic and social impacts, education, and other cultural impacts, it also brought new opportunities and potentials in people and communities to rethink and contribute in a different way to the world. Following are not an exhaustive list, but through some lights on the new and emerging potentials.

15.3.1 Positioning Ourselves in the Complex Risk Landscape

Pandemic is not just a health-related problem, it has created a deep socio-economic problem, as well as made a technological divide. If one looks at the World Economic Forum Risk Outlook (WEF 2021), infectious disease tops the risk chart in terms of impacts. However, in terms of likelihoods, it is still the environmental risks which dominates, which are climate issues, extreme weather, biodiversity losses, etc. A new set of risks is arising focusing on digital power concentration and digital divide. This will be a significant area where there need to be future technical, social, cultural, intellectual inputs, and HEIs are very well placed for that. Inclusive growth is important and we need to reduce the digital divide to enhance inclusive growth.

15.3.2 Learning the Lesson of Urgency

People say that "*Pandemic has vaccine but climate change has no vaccine,*" which may not be the right statement. We have vaccine in climate change: the mitigation and adaption options are well known. However, the challenge is how we use it with a sense of urgency. So, the countries need to draw lessons from pandemic response and make climate response with equal state of urgency. Still we have a mindset that climate change is for next 50, 70, 100 years events. However, climate is changing and evidences are there on different sectors, be in agriculture, food security, water, health, oceans, glacier, biodiversity, urban areas, and so on. The pandemic gives us a good lesson to bring the spirit of urgency in different sectors, and HEIs can play an important role through research and innovation.

15.3.3 Belief in Science

As we were struggling in pandemic, we were very much relying on science. At the initial stage we tried to understand the nature of virus, how to stop its spread, then vaccine, different scenario, etc. The status of belief in science and its application

to the decision-making has increased significantly. The same spirit can be used in other sectors, including, disaster, climate change, etc., and to act wisely, not ad-hoc actions. Science policy interface is the key area, where the thrust should be. Adaptive governance in decision-making will be the new normal. We need to distinguish between adaptive and ad-hoc governance. We have now better science and better technology knowledge to respond to the uncertainties. We have not experienced earlier this type of complex/compound emergencies like typhoons/floods or other natural hazards happening within pandemic. New sets of governance mechanisms become important, which needs to go beyond the conventional decision-making. Collective and open governance is becoming a new normal, which will be very relevant for addressing different issues related to development, environment, disaster, and climate change sectors.

15.3.4 Multi, Inter, Trans-Disciplinary: From Words into Action

Although in the HEIs, we often talk about multi/inter or trans-disciplinary research, we hardly practice it. However, the pandemic really showed us the importance, usefulness, and need of these types of research and innovation. At different stages of the pandemic, the collaboration of the virologist, epidemiologist, public health specialist, logistic specialist, information technology has proven to be effective in developing different scenario and linking them to decision-making. It shows that if properly done, the multi and trans-disciplinary research can address and solve many real-life problems. HEIs should promote this more strongly with visible and tangible outputs.

15.3.5 Innovation Potentials

It is often said that, 12 years of innovation is done in 12 months during pandemic. There were lockdowns in different aspects of lives, but there was no lockdown on innovation, rather the intense social and phycological pressure of pandemic has urged and made new innovation ecosystem. We need to bring this momentum for future problem solving, where the HEIs need to come out from their comfort zones and start non-conventional collaboration to address different social problem. There are immense scopes in the universities and HEIs to do that. We need to break the disciplinary boundary to work among different disciplines, we need to break the university boundary to work together with communities, civil society, private sector. The so called "*last mile*" needs to be the "*first mile,*" where we need to put the communities and beneficiaries at the center and start our innovation from there. A process of co-design to co-delivery of solutions is an absolute need in the current

time. To do this, we need to provide platform of innovation, in terms of incubation center in the universities and HEIs. This will enhance generation of young social entrepreneurs, who can be the key change agent in our society.

15.3.6 Creative Risk Communication

Pandemic also showed us the importance of communicating invisible risk. During the nuclear disaster of Fukushima in 2011, which was also an invisible disaster but the radioactivity could be measured. However, for pandemic, it is not only invisible, there is hardly any concrete measurement of the amount of virus in the air. Thus, reliable risk communication becomes very important, where science plays a critical role, and trust in the information is the key. During the pandemic, there are different creative risk communication, which can give us different hints of future risk communication for both visible and invisible risks in case of disaster, climate change, and other environmental risks.

15.4 Way Forward

15.4.1 Inclusive BCP/ECP

None of the business continuity plan (BCP) or education continuity plan (ECO) worked during the pandemic, since most of the BCP were focusing on different types of natural hazards, without taking into account of complex risk scenario. Cascading/compounded/complex emergencies are becoming new normal in the changing risk landscape. There, the worst-case scenario preparation and including it into BCP/ECP is an absolute must. The BCP/ECP should not only include structural and non-structural measures, drawing lessons from the pandemic, but should also have system related challenges, and how to overcome those issues. This includes financial decision-making, legal issues, psychological/social support system, etc.

15.4.2 Flexible HEIs

In the "new normal" era, flexibility and adaptation are keywords. The HEIs who were flexible enough to adjust to the changing situation could continue their education in some ways. Adaptive governance concept is also applicable in the HEI governance, where new decisions need to be taken based on the changing situation. Science,

evidences play important roles in higher education governance. Customized education depending on the student's situation is also desirable, and that shows the maturity of the education system in the country.

15.4.3 Social Support Mechanisms

The pandemic has shown that HEIs are very much part of the society and system. Link to the communities is an important aspect. Some of the HEIs regularly perform community immersion programs, where the student has an exposure to the different issues of the community. That not only helps in the development of the intellectual capacity of the students, the stronger bond/network with the community becomes an asset to the HEIs also. This should be promoted actively for all the students in the HEIs. Usually, in an education system of any country, elementary education is very much linked to the community, and school community linkages are often highlighted. When we go to higher education, we often lose the link to community. However, the pandemic has shown in many instances in different countries on how the communities help the HEIs positively. Thus, it is evident that the strong bonds with the community and developing a social support mechanism for the student become critical.

15.4.4 Positivity

Amidst the difficult time of the pandemic, it is important to spread the video of positivity, and HEIs, through its young students can initiate that. It can be done through social interactions, through different cultural and sport events, university festivals, open campus initiative, etc. Some of these can be done online, some can be face to face depending on the nature and spread of COVID-19. HEIs have strong youth power, and this can and should be mobilized in the positive way.

15.5 Epilogue

Pandemic gave us different lessons in a hard way. Co-existence with nature is the key to the future sustainability and survival. We have now understood the importance of nature and how human should behave in a more responsible way. In this way, pandemic worked as a break in the busy lifestyle, which gave us some time to rethink about our own existence. Resource utilization is another aspect we learned when there was scarcity of resources. Appreciating different services is also important, where we re-realize the importance of education, health care, and other service sectors, which we otherwise take it granted.

The most important aspect HEIs should promote is the "education for sustainability," which is a value education system needs to be promoted across all disciplines. There are three major step of education for sustainability: (1) learning to know: this is the knowledge system which provides us basic information, (2) learning to do: this is the technology system which gives us the know-how on how to act, how to solve a problem, and (3) learning to be: this is the value education, which helps us to develop a dignified human being. While we are good in the first two aspects in HEIs, we often miss the most important aspect of value education. Through the hard lessons of the pandemic, the HEIs should make sincere efforts for value education not only through curriculum, but also through developing a unique education system where every student's own potential can be enhanced and importance of human, community, nature connectivity is properly highlighted.

References

Bergan S, Gallagher T, Harkavy I, Munck R, Land H (2021) Higher education's response to the Covid-19 pandemic—building a more sustainable and democratic future. Council of Europe Higher Education Series No. 25, 330 pp

Farnell T, Skledar Matijević A, Šćukanec Schmidt N (2021) The impact of COVID-19 on higher education: a review of emerging evidence. NESET report. Publications Office of the European Union, Luxembourg. https://doi.org/10.2766/069216

MEXT (2018) Guidelines on recognition of higher education qualification—Asia Pacific regional convention on recognition of higher education qualification, in Japanese. Available from https://www.mext.go.jp/content/1420033-1.pdf. Accessed 23 Oct 2021

Smalley A (2021) Higher education responses to coronavirus. Available at https://www.ncsl.org/research/education/higher-education-responses-to-coronavirus-covid-19.aspx. Accessed 23 Oct 2021

THE (2020) The impacts of coronavirus on higher education. Available from https://www.timeshighereducation.com/hub/keystone-academic-solutions/p/impact-coronavirus-higher-education. Accessed 23 Oct 2021

WEF (2021) The global risk report. World Economic Forum. Accessed from https://www.weforum.org/reports/the-global-risks-report-2021. Accessed 23 Oct 2021